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The discovery of *Megalota* in the Neotropics, with a revision of the New World species (Lepidoptera: Tortricidae: Olethreutini)

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Abstract

Megalota Diakonoff, previously known from the Indoaustralian Region (India, Sri Lanka, New Guinea, and Australia), Madagascar, and Africa, is reported from the Neotropics for the first time. Three previously described New World species (i.e., *Megalota submicans* (Walsingham), n. comb.; *M. delphinosema* (Walsingham), n. comb.; and *M. plenana* (Walker), n. comb.) were concealed within incorrect generic assignments or as "unplaced" species (i.e., lacking contemporary generic assignments). Twenty-one new species are described and illustrated: *M. synchysis* (TL: Venezuela), *M. peruviana* (Peru), *M. aquilonaris* (Mexico), *M. vulgaris* (Costa Rica), *M. cacaulana* (Brazil), *M. macrosocia* (Ecuador), *M. ochreoapex* (Costa Rica), *M. spinulosa* (Costa Rica), *M. simpliciana* (Costa Rica), *M. jamaicana* (Jamaica), *M. ricana* (Costa Rica), *M. ceratovalva* (Venezuela), *M. bicolorana* (Costa Rica), *M. longisetana* (Costa Rica), *M. deceptana* (Costa Rica), *M. crassana* (Costa Rica), *M. gutierrezi* (Costa Rica), *M. chamelana* (Mexico), *M. beckeri* (Brazil), *M. flintana* (Brazil), and *M. pastranai* (Argentina). Males of the genus are characterized by three distinctive features of the genitalia: the uncus consists of a pair of greatly expanded, flattened, variably round or square lobes, densely covered with spines and setae; the valvae are narrow with an elongate, apically spined process arising from the base of the costa; and the juxta is membranous with a narrowly sclerotized U- or J-shaped posterior edge. Five species have been reared from *Croton* spp. (Euphorbiaceae) in Costa Rica, and this is consistent with a single record of this host for an Australian species of *Megalota*.

Key words: Olethreutinae, new species, new combinations, genitalia, hairpencil, host plants, *Croton*, Euphorbiaceae, biogeography

Prologue

Discoveries in systematics often are the result of coincidence or serendipity, when two or more pieces of a puzzle come together to provide a glimpse into the bigger picture of biogeography, phylogeny, life history, or some other aspect of natural history or taxonomy. The discovery of *Megalota* in the New World represents such a discovery, and compilation of the scattered specimens and data on the Neotropical members of the genus was facilitated by numerous sources, including a world community of tortricid workers, the presence of unsorted specimens in museum collections, large-scale faunal inventories in Costa Rica, the recent publication of a world catalog of the family, and a variety of other intangible coincidences. Below I briefly describe this serendipitous journey of discovery.

While examining specimens from Costa Rica collected by David Wagner during field work in 2005, as part of the NSF-funded Arthropods of La Selva Project (ALAS), I somewhat arbitrarily selected for dissection a small, orange-brown olethreutine moth that superficially resembled the genus *Olethreutes* of the Holarctic. To my surprise, the male genitalia revealed a huge, somewhat cordate uncus and relatively complex valvae with slight asymmetry and an unusual elongate process from the costa near its base. Although I initially suspected that the specimen represented a new genus because it was so dissimilar to all other Neotropical Olethreutini I had seen, the more I pondered the dissection, the greater my suspicion grew that I had seen these unusual genitalia somewhere before, and recently. So I began examining my most recent reprints from colleagues around the world. It wasn't long before I stumbled upon a paper published by Leif Aarvik in 2004 describing several new species of *Megalota* from Africa. I immediately recognized that the male genitalia of the Costa Rican species were congeneric with, and nearly indistinguishable from, Aarvik's new species from Africa. In the tortricid world, connections between the Afrotropical and Neotropical faunas are few and far between, so this discovery was accompanied by considerable excitement. Consultation with the recently published world catalog of Tortricidae revealed that *Megalota* included about a dozen species described from Australia, southeast Asia, Madagascar, and Africa. Adding the Neotropics to this list appeared to complete a pan-tropical distribution for the genus.

I immediately wrote to Jerry Powell, my mentor and fellow ALAS collaborator, to share this discovery and ask if he had additional material from Costa Rica. To my surprise, Jerry also recalled seeing similar male

genitalia. He indicated that there likely was a specimen in the unsorted Tortricidae in the U.S. National Museum, right under my nose, collected by André Blanchard in Texas many years ago. He recalled there was a photograph with the specimen, and remembered seeing something similar in Jack Clarke's volumes on the Meyrick types at the British Museum. After a short search of the collection, I discovered the alleged specimen along with two photographs–one of the adult and one of the male genitalia of "*Episimus submicans*" that Kevin Tuck, a good friend and colleague in London, had provided to Jack Clarke in 1984, over 20 years ago. The genitalia were a good match; there was a species of *Megalota* already described from the New World concealed under an incorrect generic assignment. The species *submicans* was described from Grenada, and I was certain the only way I would ever be able to examine material from there was to borrow the type from The Natural History Museum, London.

In the meantime, I began searching through the mountain of unsorted Neotropical Tortricidae in the USNM collection, examining anything that resembled North American *Olethreutes*. To my delight, I soon discovered seven specimens of *Megalota* collected over 100 years ago by William Schaus... on Grenada! Those specimens, a series of males and females, had been waiting patiently for over a century in the miscellaneous Tortricidae for me to discover them. As I continued to look through the unsorted material, I discovered over 100 specimens of *Megalota* ranging from Texas to Argentina, including a handful of specimens from Brazil collected by another colleague, Vitor Becker.

Upon returning to Instituto Nacional de Biodiversidad, Heredia, Costa Rica (INBio), later that year to continue work on the ALAS project, I discovered over 300 specimens of *Megalota* in that collection, representing at least a dozen species. There seemed to be no end to the specimens and species that lay hidden in collections.

The final discovery, likewise, was right under my nose. A large insect cabinet in my office is the home to most of the microlepidoptera reared by Daniel Janzen and Winnie Hallwachs over the past 20 years of work on the Lepidoptera of Santa Rosa National Park in northwestern Costa Rica. Out of curiosity I decided to take a short peek at that collection on the chance that a specimen of *Megalota* may have been reared. Indeed, there I found four species of *Megalota* with host plant data, all reared from *Croton* (Euphorbiaceae), specimens I had sorted to morpho-species sometime in the distant past. Amazing! After many dissections and considerable review of the literature and communication with fellow tortricologists, I had documented 24 species of *Megalota* in the New World, with 21 new species and host plant records for 5 species. This was clearly the most remarkable case of serendipity of my career, and it all began with the naive dissection of an unknown tortricid from Costa Rica.

Introduction

Global patterns of biogeographic distribution for many genera of tortricid moths are obscured by the absence of meaningful generic assignments for many species and the abundance of undescribed species, particularly in the New World tropics. Over the past 25 years, some of these shortcomings have been remedied, with contemporary generic placements of several Neotropical species revealing extraordinarily interesting distributional patterns. Contributing to this understanding are studies on the Afrotropical fauna by Aarvik (2004a, b, 2005) and Razowski (1995, 2005a, b) and the Australian fauna by Horak (2006). For example, the genus *Cosmorrhyncha* is now known to occur in Africa (including Madagascar) and Central and South America (Powell *et al*. 1995; Aarvik 2004b); *Neopotamia* is recorded from southeast Asia and Central America (Powell *et al*. 1995; Diakonoff 1973); *Apotofoma* Busck is recognized as occurring in the Afrotropical and Neotropical regions (Razowski 1993, 1995); and *Phricanthes* is known to be resident in Australia, southeast Asia, Madagascar, Africa, and Central America (Brown 2007). While some of these patterns may be the result of the activities of man, others certainly reflect patterns of historical biogeography.

Recent systematic studies on the fauna of Costa Rica revealed the presence of several species of *Megalota*, a genus formerly recorded from Australia, southeastern Asia, Africa, and Madagascar (Aarvik 2004b; Brown 2005; Horak 2006). During efforts to determine the diversity of the genus in the New World, specimens were discovered from Texas, U.S.A., south to Argentina. The purpose of this paper is to review the New World species of *Megalota*, describe 21 new species, propose three new combinations, and provide data on host plants for the genus in the New World.

Materials and methods

Dissection methods follow those presented in Brown and Powell (1991, 2000). Images of adults and genitalia were captured using a Microptics digital camera system and enhanced using Adobe and Illustrator software. Terminology for genitalia structures and wing venation follows Horak (1984) with specific modifications for the genus as used by Diakonoff (1966, 1973) and Aarvik (2004b), and a few other terms redefined below. In referring to the valvae, the left valva of the image of the genitalia is assumed to represent the left valva of the specimen. The prominent, elongate, spined process from the costal margin of the valva near the inner base was referred to as the "labis" by Diakonoff (1966). However, this term is applied more appropriately to the expanded lobe at the base of the transtilla (Razowski 2008). Hence, I follow Aarvik (2004b) and refer to this structure as the "basal process of the valva." In the female genitalia, the strongly sclerotized, posterior portion of the ductus bursae immediately anterad of the ostium is referred to as the colliculum.

Informal species groups (indicated by A, B, C, and D) are defined based on morphological features of the male and female genitalia. Two species known only from males have genitalia that deviate considerably from those of the other species groups, and each is assigned to its species group (i.e., C and D). One species bridges the gap between the two larger species groups, and its assignment is based on the male genitalia. The sequence in the text of species within species groups reflects overall similarity in genitalia. Hence, the first species of the *delphinosema* group (group B) is *M. ochreoapex* because of its similarity to members of the preceding species group (group A).

The following institutional abbreviations are used for the deposition of specimens examined: BMNH, The Natural History Museum, London, United Kingdom; INBio, Instituto Nacional de Biodiversidad, Santo Domingo de Heredia, Costa Rica; SDNHM, San Diego Natural History Museum, San Diego, California, U.S.A.; EME, Essig Museum of Entomology, University of California, Berkeley, U.S.A.; and USNM, National Museum of Natural History, Washington, DC, U.S.A. Other abbreviations used in the specimens examined section are as follows: ca. = circa (approximately); Est. = Estación; P.N. = Parque Nacional; r.f. = reared from.

Systematics

MEGALOTA DIAKONOFF, 1966

Megalota Diakonoff, 1966 was described to accommodate *Polychrosis fallax* Meyrick, 1909 (from India, designated as the type species), *Polychrosis anceps* Meyrick, 1909 (from Sri Lanka), and *M. vera* Diakonoff, 1966 (from the Bismark Islands). Subsequent authors (Diakonoff 1973, 1981; Aarvik 2004b) added new species and new combinations, bringing to 12 the number of species, and revealing a distribution that included Australia, the Oriental Region (India, Sri Lanka, Indonesia), Madagascar, and Africa (Brown 2005).

Diakonoff (1966) provided a comprehensive description of the genus, including features of the head, wing venation, and male and female genitalia. He repeated his description in a slightly abbreviated form and expanded the genus to six species through the addition of one new combination and two new species (Dia-

konoff 1973). He subsequently (Diakonoff 1981) added a new species from Madagascar. Horak *et al*. (1996) included two species in the Australian fauna. Aarvik (2004b) revised slightly Diakonoff's description to include features of species from Africa, describing three as new and proposing one new combination. Most recently, Horak (2006) provided a thorough diagnosis and redescription of the genus along with illustrations of adults, wing venation, and male and female genitalia for Australian members. Because *Megalota* is well defined, diagnosed, and illustrated in the work of Diakonoff (1966, 1973), Aarvik (2004b), and Horak (2006), there is no need to redescribe it here.

All species of *Megalota* are characterized by three distinctive features of the male genitalia which likely represent synapomorphies for the genus: the uncus consists of a pair of greatly expanded, round or square, flattened lobes, densely covered with spines and setae (see Figs. 25 and 37); the valvae are narrow with an elongate, prominent, spined process arising from the costal margin near the inner base (see Figs. 25 and 37); and the juxta is a semi-membranous plate with the posterior edge somewhat J- or U-shaped and narrowly sclerotized (see Fig. 27 for lateral view of juxta, still attached to phallus).

There is some inconsistency in the use of the term "labis" for a structure of the male genitalia in *Megalota*. Diakonoff (1966) used the term for the prominent spined basal process of the valva. However, according to Razowski (2008) "labis" refers to the laterally swollen bases of a mesally interrupted transtilla, as in *Clepsis* species (Tortricinae: Archipini). Horak (2006) refers to this structure in *Megalota* as a "very large cone- to club-shaped basal valva process…" To avoid confusion, I follow Aarvik (2004b) and refer to the structure as the basal process of the valva.

Males of *Megalota* can be distinguished superficially from many similar Neotropical Olethreutini by the presence of a well-defined anal fold or roll in the hindwing (lacking in a few species) and the thickened hind tibia with dense scales on the inner portion and a thick tuft of fine hairs in the middle, with a slender groove on the dorsum concealing a fascicle of long slender scales (hairpencil) originating at the base. While characteristic of many species of Nearctic *Olethreutes* Hübner, 1822, these features are absent in most Neotropical Olethreutini. The New World members of *Megalota* are characterized by a small, rounded-triangular lobelike expansion of the tegumen subdorsally immediately below the junction of the tegumen with the uncus (see Fig. 26). Males of many species have a slender, weakly sclerotized, longitudinal strut on the invaginated portion of the membrane of the tegumen associated with sternite 9.

Megalota was recognized as a member of the subtribe Neopotamiae (tribe Olethreutini) by Diakonoff (1973), who proposed the subtribe for 11 genera from Southeast Asia; he (Diakonoff 1983) subsequently added a twelfth genus from Madagascar. According to Diakonoff (1973), male genitalia of the group are characterized by a tendency to develop a long, hairy, bristly basal process of the valva; the uncus often is very large, bifid or bilobed; and the sacculus sometimes has the setal clusters Spc_1, Spc_2, and Spc_3 (*sensu* Heinrich 1926: figs. 39-62) asymmetrical, i.e., those clusters of setae differ between the right and left valva. Kuznetzov and Stekolnikov (1984) agreed with Diakonoff's assessment, referring to the group as "Neopotamiina." In his revision of the African members of the subtribe, Aarvik (2004b) referred *Eccopsis* Zeller, *Cosmorrhyncha* Meyrick, *Basigonia* Diakonoff and six new genera to the subtribe. Although Horak (2006) suggests that *Costosa* Diakonoff may be the sister-group to *Megalota*, features of the male genitalia (e.g., bilobed uncus) and female genitalia (e.g., shape of the signum) suggest that *Eccopsis* and *Cosmorryhncha* may be more closely related to *Megalota* than *Costosa*. *Megalota* and *Eccopsis* also share similar facies, and *Eccopsis* and *Cosmorrhyncha* share nearly identical genitalia.

Within *Megalota*, most species can be distinguished superficially by subtle features of the forewing pattern combined with forewing length; however, the male and female genitalia provide the most reliable features for discriminating species. As suggested by Aarvik (2004b), the phallus provides some of the best characters, e.g., presence/absence, size, and location of external spines, and size and number of cornuti in the vesica. The configuration of the clusters of setae from the middle portion of the valva also is highly useful for separating most species; the shape of the sterigma usually is species-specific in the female.

Based on genitalia, two distinct species groups (plus two unassigned species and one "intermediate" species) can be recognized. Members of the *submicans* group are characterized by a conspicuous, usually incurved, distally attenuate process near the middle of the valva (see Fig. 25); a basal process of the valva that usually is less than 3 times as long as wide (see Fig. 25); elongate setae, usually asymmetric in length (different between the right and left valvae), from the basal third of the valva (see Figs. 25-29); and a signum in the form of a small cluster of short, blunt spines (see Figs. 49-54). Members of the *delphinosema* group lack the prominent incurved process from the valva (see Fig. 37); have a basal process of the valva that usually is greater than 3 times as long as wide, smooth along the outer surface, and usually elbowed before the middle on the inner surface (see Fig. 37); possess setae that are symmetrical between the right and left valva; and have a signum in the form of a tonguelike or finlike sclerite (see Figs. 55-63). The male genitalia of most members of the *delphinosema* group are characterized by two patches of highly modified setae on the valva: a dense cluster of short, straight, somewhat rigid, spiniform setae (= cluster of spiniform setae) and a second more sparse patch of longer, finer, less rigid setae, usually situated basad to the dense cluster (= patch of elongate setae) (see Fig. 37). The male genitalia of *M. plenana* (Walker) (Fig. 46), and *M. pastranai* Brown, n. sp. (Fig. 48), deviate considerably from those of other *Megalota*, and the females of these two are unknown. These species provisionally are assigned to *Megalota* on the basis of the broadened uncus and the elongate basal process of the valva. They each are assigned to their own species group. In *M. ochreoapex* Brown, n. sp., the male genitalia (Fig. 32) are typical of the *delphinosema* group, but the female genitalia (Fig. 54) are clearly of the *submicans* group type.

Key to the species groups of *Megalota* based on male genitalia

1. Basal process of the valva longer than valva (Fig. 46) ..... C. *plenana* group
- Basal process of the valva shorter than valva 2
2. Basal process of the valva triangular, with small sclerotized distal hook (Fig. 48)..... D. *pastranai* group
- Basal process of the valva variable but not triangular, densely spined in distal 0.15-0.25, without hook 3
3. Valva with large, distally attenuate, incurved process near middle bearing dense spiniform setae (Fig. 25-30) .... A. *submicans* group
- Valva without large incurved process near middle bearing dense spiniform setae (Figs. 31-45)..... ..... B. *delphinosema* group

Key to the species groups of *Megalota* based on female genitalia

1. Signum in the form of a parallel-sided, tongue- or fin-shaped sclerite (Figs. 55-63); colliculum comprising about half of ductus bursae ..... B. *delphinosema* group
- Signum stellate or comblike (Figs. 49-54); colliculum comprising one-third or less of ductus bursae .... A. *submicans* group[1]

[1] Although the female genitalia of *M. ochreoapex* (Fig. 54) have a signum typical of *submicans* group, the male genitalia are characteristic of species of the *delphinosema* group, and on the basis of the latter, the species is assigned provisionally to the *delphinosema* group.

A. The *submicans* group

The *submicans* group consists of 7 species: *M. submicans* (Walsingham), n. comb., *M. synchysis* Brown, n. sp., *M. peruviana* Brown, n. sp., *M. aquilonaris* Brown, n. sp., *M. vulgaris* Brown, n. sp., *M. macrosocia* Brown, n. sp., and *M. cacaulana* Brown, n. sp. The female genitalia are characterized by a sclerotized, shield-

shaped plate representing the lamella postvaginalis, behind which usually is an asymmetrical mesal lobe, and the signum is in the form of a stellate or somewhat comblike band in the corpus bursae. The strongly sclerotized colliculum comprises one-third or less of the ductus bursae. The shape of the signum is shared with all known females of *Megalota* from the Old World and several genera outside the *Neopotamia*-group *sensu* Horak (2006) (e.g., *Metendothenia* Diakonoff, *Statherotis* Meyrick, *Metrioglypha* Diakonoff), although in most Old World genera the signum is paired. Females of the remaining New World species of *Megalota* (*delphinosema* group) have a tongue- to fin-shaped signum consisting of a single flattened sclerite.

Male genitalia of the *submicans* group are characterized by a prominent incurved process from near the middle of the valva covered by a patch of long, strong setae that originates near the base of the process and continues to its distal end. The patch of elongate setae in the basal or subbasal portion of the valva usually is asymmetrical between the left and right valva. The basal process of the valva generally is short, stout, and blunt, often slightly dilated apically, usually bearing 4–5 large, bear-clawlike thorns. The tegumen is subrectangular, slightly and evenly concave laterally between the base of the valva and the uncus, with a dorsal lobelike expansion near the base of uncus. Nearly all species have one or more tiny external thornlike spines distally or subdistally on the phallus. The hind tibia usually bears bushy white to grayish white scales that conceal a cream-colored hairpencil. Differences in genitalia among species of this group are considerably less pronounced than among species of the *delphinosema* group.

Although some adults of *Megalota* can be distinguished by a combination of external features, such as forewing maculation, forewing length, male secondary scaling, and collecting locality, most specimens I examined are flight worn and many of these superficial features are subtle, at best. Hence, dissections of the male genitalia provide the only means for accurate identification.

Key to males of the *submicans* group based on genitalia

1. Setae from basal one-third of valva dramatically asymmetrical from left to right side, with extremely elongate setae on left valva (greater than half the length of valva), and fewer, much shorter setae on right valva (Figs. 25-27) 2
- Setae from basal one-third of valva essentially symmetrical from left to right side, with setae less than one-half the length of valva 4
2. Basal process of the valva > 3 times as long as wide, narrowed distally (Figs. 26, 27) 3
- Basal process of the valva < 3 times as long as wide, more or less uniformly in width or slightly narrowed subbasally ..... 1. *submicans*
3. Distal end of phallus with flattened flange (Fig. 27), lacking thorns ..... 3. *peruviana*
- Distal end of phallus without flattened flange, with one or two minute thorns (Fig. 26) ..... 2. *synchysis*
4. Uncus with anterior edge straight; posterior edge of tegumen with deep lateral notch (Fig. 30) ..... 6. *cacaulana*
- Uncus with anterior edge rounded; posterior edge of tegumen with shallow lateral notch 5
5. Socius in the form of a conspicuous, rounded, pendant lobe; subbasal patch of setae a dense, compact cluster (Fig. 31) ..... 7. *macrosocia*
- Socii short, membranous, reduced to a patch of fine hairlike bristles; subbasal patch of setae more sparse, not forming a compact cluster 6
6. Distal setae of incurved process from mid-valva as long as process, projecting ventrally (Fig. 29) ..... 5. *vulgaris*
- Distal setae of incurved process from mid-valva shorter than process, projecting outward-laterally (Fig. 28) ..... 4. *aquilonaris*

1. *Megalota submicans* (Walsingham), new combination

Figs. 1, 25, 49

Episimus submicans Walsingham, 1897: 124; Powell *et al*. 1995: 152; Brown 2005: 308.

Diagnosis. *Megalota submicans* can be distinguished from *M. synchysis* by the possession of a small posteriorly-projecting thorn at the distal end of the phallus; in *M. synchysis* the thorn projects more laterally and is located slightly subapically. Also, the basal process of the valva of *M. submicans* is nearly uniformly in width, whereas that of *M. synchysis* is broadest in the basal half and conspicuously narrower in the distal half. In the female genitalia of *M. submicans*, the subtriangular mesal lobe of the sterigma is oriented almost directly posterad, while in *M. synchysis* it is oriented more laterad.

Redescription. *Head*: Vertex mixed pale brown, creamy brown, and creamy white, frons mostly creamy white; labial palpus creamy white with small patches of brown and a small patch of pale red-brown near tip of segment II. *Thorax*: Dorsum pale gray brown with some creamy white-tipped scales, posterior crest dark copper-brown. Hind tibia in male with conspicuously enlarged tuft of white scales and hairpencil. Forewing length 6.1–7.1 mm (mean = 6.5); pattern complex, variable; basal 0.25 mostly pale brown with irregular patches of pinkish brown and creamy white, bordered distally by a curved, pinkish gray subbasal fascia with undulate edges, faintly outlined by creamy white; mesal 0.25 of wing darker with small, dark red-brown semicircular blotch from costa near middle; a small, slender, oblong brown patch from near mid-termen approaching costa ca. 0.75 from base to apex, ending bluntly before reaching costa, bordered by area of pinkish cream-white, irregularly reticulated with orange-brown. Hindwing pale brown; anal margin in male with fold poorly defined. *Abdomen*: Dark fuscous. Short, white tuft of scales from posterior edge of the sterigma in female, one at latero-anterior end of each papilla analis (lost in slide mounted preparations). Male genitalia (Fig. 25; 6 preparations examined) with tegumen elongate-ovate, slightly concave laterally with small expanded lobe just before uncus; uncus broadly cordate with shallow mesal notch, densely spined; socius membranous with few bristles; valva asymmetrical, venter of left valva bent at ca. 100° angle about 0.33 distance from base with sparse patch of long setae in basal half, with setae nearly as long as valva; venter of right valva evenly curved with sparse, shorter setae (often lost in slide preparations); a broad, incurved projection from valva ca. 0.65 distance from base to apex, strongly sclerotized along one side with tiny, distally-curved setae; dense patch of long, fine setae at base of projection; basal process of the valva short, stout, ca. 3 times as long as wide, with 3-5 large spines at blunt distal end. Phallus slender, ca. 0.15 as wide as long, elongate, ca. 0.5 as long as valva, slightly curved in basal 0.3, with small external thorn near tip; vesica with two small, slender cornuti. Female genitalia (Fig. 49; 6 preparations examined) with papillae anales unmodified; sterigma rounded shield-shaped, with slender triangular process with rounded apex mesally posterad of ostium, directed slightly to right; colliculum occupying posterior 0.3 of ductus bursae, weakly curved at anterior end, with C-shaped opening at anterior end, anterior 0.7 of ductus bursae membranous; corpus bursae rounded-oblong, finely punctate throughout; signum a short irregular band of blunt spines of variable length from a weakly sclerotized plate.

Holotype. Male, West Indies, Grenada, Balthazar (Windward side), [no date] H. H. Smith, Walsingham Collection 1910–427 (BMNH).

Additional Material Examined (13♂, 42♀). WEST INDIES: **Grenada**: [no date] (4♂, 3♀), W. Schaus (USNM). L. Grand Etang, 4–6 Aug 1963 (1♂), O. S. Flint (USNM). **Dominica**: Clarke Hall, 3 Feb 1964 (1♂), D. F. Bray (USNM), 25 Apr 1964 (1♀), O. S. Flint, Jr. (USNM), 8 Jan 1965 (1♀), 9 Jan 1965 (1♀), 10 Jan 1965 (1♀), 12 Jan 1965 (1♀), 14 Jan 1965 (1♂), 22 Jan 1965 (1♀), 24 Jan 1965 (1♀), 5 Feb 1965 (1♀), all J. & T. Clarke (USNM), 21–31 Jan 1965 (1♂, 1♀), W. W. Wirth, light trap (USNM). Grande Savane, 13 May 1964 (3♂, 8♀), 20 May 1964 (1♀), 7 Jun 1964 (3♀), 1 Jul 1964 (8♀), all O. S. Flint, Jr. (USNM), 11 Jun 1965 (1♂, 2♀), D. R. Davis (USNM). Springfield Est., 20–26 Jul 1963 (1♀), O. S. Flint, Jr. (USNM). **St. Lucia**: Cul de Sac R. at M.P. 9, 29 Jul 1963 (2♀), Flint & Cadet (USNM). Marisule, 30 Jul 1963 (2♀), O. S. Flint, Jr. (USNM). Vergallier R., nr Marquis, 31 Jul 1963 (1♀), Flint & Cadet (USNM). Miguy, 19 Nov 1975 (1♀), [no collector] (USNM). 1.5 mi S Mt. Gimie, 19–24 Nov 1975 (1♂), E. L. Todd (USNM).

Distribution and Biology. *Megalota submicans* appears to be widely distributed in the West Indies (Caribbean), with numerous records from Grenada, St. Lucia, and Dominica. Adults have been collected primarily in May through August, with a few specimens from November (n = 2), January (n = 5), and February (n = 1). Nothing is known of the early stages.

Remarks. Although *M. submicans* was described in *Episimus* and treated as such by Powell *et al*. (1995) and Brown (2005), the forewing pattern, male secondary scaling, male genitalia, and female genitalia all provide convincing evidence that it belongs in *Megalota*.

Megalota submicans ranges throughout much of the Caribbean, with slight morphological variation detectable among populations from different islands—Grenada (type locality), Dominica, St. Lucia–especially in the position and shape of the external thorn of the phallus. While these differences potentially represent species-level character states, they are difficult to quantify; hence, I adopt a conservative approach and treat all Caribbean members of the group as conspecific with *M. submicans*. In contrast, the *submicans*-like populations from Venezuela (e.g., Rancho Grande, 1100 m) have differences in the male and female genitalia that are more easily described, and combined with the different habitat and elevation, I consider these to represent a distinct species, *M. synchysis*.

I have examined at least ten specimens that are extremely similar to *M. submicans* but are different enough in details of the genitalia that their assignment to that species is questionable. A single male from Hidalgo County, Texas (USNM) may represent *M. submicans*, but the phallus is much longer and more curved than in other specimens. A series of specimens (n = 3 USNM and 3 EME) from Veracruz, Mexico also appears to represent *M. submicans*, but males lack the distinctive angle at the ventral edge in the basal portion of the valva characteristic of *M. submicans*, and females have a weakly sclerotized, rounded disc around the post-osteal region. Extraordinarily, a single male from Formosa, Argentina (USNM) also appears to represent this species. While it is possible that the Mexican and Texas specimens are conspecific with *M. submicans*, it seems unlikely that the Argentine specimen is. It also is possible that each of these groups represents a distinct species, but owing to the paucity of material, they are difficult to circumscribe confidently.

2. *Megalota synchysis* Brown, new species

Figs. 2, 26, 50

Diagnosis. *Megalota synchysis* is similar to *M. submicans* both superficially and in features of the male and female genitalia. Both have a similar patch of elongate, distally curved setae from the subbasal region of the valva that is asymmetrical between the left and right valva; a similar large, incurved projection near mid-valva; and an asymmetrical lobe in the middle of the lamella postvaginalis. In *M. synchysis* the phallus is slightly less curved and has a more lateral and subdistal thorn; the basal process of the valva is widened subbasally rather than subapically, and the mesal lobe of the sterigma is angled more to the right. Geographic and elevational separation of the two provides further evidence that they represents different species. In both species the forewing pattern is somewhat variable from two-toned (pale basal 0.5 and darker distal 0.5) to nearly uniformlyly darker and mottled.

Description. *Head*: Vertex mixed pale brown and creamy brown, frons mostly creamy white; labial palpus creamy white with patches of brown and red-brown scales near tip of segment II. *Thorax*: Dorsum pale gray brown and creamy white, metascutum with posterior crest dark copper-brown. Hind tibia with bushy tuft of white scales and hairpencil. Forewing length 6.4–6.8 mm (mean = 6.5); basal 0.4 a patchwork of pale brown, pinkish copper-brown, and creamy white; mesal portion of wing darker with small, dark red-brown, semicircular blotch from costa ca. 0.45–0.65 distance from base to apex with an additional comma-shaped marking in discal cell; a small, slender, oblong brown patch from near mid-termen terminating bluntly near end of discal cell; areas above and below patch pale pinkish creamy white. Hindwing dark brown, anal margin in male with fold weakly developed. *Abdomen*: Brown. Short, white tuft of scales from posterior edge of the sterigma in female, one at latero-anterior end of each papilla analis (lost in slide-mounted preparations). Male genitalia (Fig. 26; 4 preparations examined) with tegumen subrectangular, slightly concave laterally, with lobelike expansion just below base of uncus; uncus broadly cordate with shallow mesal notch, densely spined;

socius ill-defined, membranous, with few bristles; shape of valva slightly asymmetrical, left valva with dense patch of elongate setae in basal 0.33 with setae nearly as long as valva, right valva with sparse patch of much shorter setae; a broad, incurved projection from valva about 0.67 distance from base to apex, strongly sclerotized along one side with long, curved setae; dense patch of long, fine setae at base of projection; basal process of the valva somewhat narrowed in distal 0.25, with 3–4 large spines at blunt distal end. Phallus weakly curved with small, external, sublateral thorn near tip; vesica with two small, slender cornuti. Female genitalia (Fig. 50; 3 preparations examined) with papillae anales unmodified; sterigma a sclerotized band with rounded-triangular, lobelike process in middle posterad of ostium, attenuate distally, extending to right; posterior edge of segment 7 broadly sclerotized; colliculum occupying posterior 0.33 of ductus bursae, weakly curved anteriorly, with irregular C-shaped opening at junction with remainder of membranous anterior 0.67 of ductus bursae; corpus bursae rounded-oblong; signum a short, weakly curved band of 3–5 short blunt larger spines and numerous shorter spines.

Holotype. Male, Venezuela Aragua, Rancho Grande, 1100 m, 16–23 Oct 1966, S. S. & D. D. Duckworth (USNM) [undissected].

Paratypes (6♂, 14♀). VENEZUELA: **Aragua**: Rancho Grande, 1100 m, 16–23 Oct 1966 (2♂, 9♀), 24–31 Oct 1966 (2♂, 5♀), S. S. & D. D. Duckworth (USNM), 22–23 Jan 1978 (1♂), 30–31 Mar 1978 (1♂), cloud forest, blacklight, both J. B. Heppner (USNM).

Distribution and Biology. This species is known only from Rancho Grande, Venezuela. Adults have been collected in January, March, and October. Nothing is known of the early stages.

Etymology. The specific epithet is the Greek "synchysis," meaning confused or mixed, in reference to the similarity of this species with *M. submicans*.

3. *Megalota peruviana* Brown, new species

Figs. 3, 27, 51

Diagnosis. Superficially, the forewing pattern and ground color of *M. peruviana* is much darker than that of *A. submicans* and *A. synchysis*, brown rather than tawny brown, pinkish brown, and creamy white of the latter two species. Male genitalia among the three species are similar, but those of *M. peruviana* can be distinguished by the presence of a small linear patch of spines subbasally on the basal process of the valva and a small flange at the apex of the slightly distally-flattened phallus. The female genitalia of *M. peruviana* lack the mesal lobe, instead having a somewhat tubular invagination, split mesally; the colliculum is extremely short and funnel-shaped, similar to that of *M. aquilonaris*.

Description. *Head*: Vertex pale beige, frons creamy white; labial palpus creamy white with patches of beige and brown. *Thorax*: Dorsum brown mixed with tawny brown and a few creamy white scales. Hind tibia in male with long, mostly appressed, creamy white sex scales, concealing hairpencil. Forewing length 6.5–7.5 mm (mean = 7.0); basal 0.33 pale brown with scattered creamy white and brown scales, with small blotches of darker brown forming ill-defined basal patch; middle 0.33 a dark, oblique median fascia with scattered rust-orange scales, well defined and evenly curved along basal edge, weakly outlined by pale yellow-cream line, irregularly sinuate along outer edge; distal 0.33 mostly shiny gray brown, with dark oblique obovate patch from near mid-termen extending to distal end of discal cell, then abruptly angled toward dorsum. Fringe mostly dark brown, creamy white at tornus. Hindwing uniformly brown, anal margin in male with distinct fold. Fringe brown. *Abdomen*: Brown. Male genitalia (Fig. 27; 2 preparations examined) with tegumen subrectangular, lateral sides evenly concave from dorsal base of valva to uncus; uncus cordate with broadly v-shaped dorsal notch, each lobe densely spined; socius ill-defined, membranous; valva relatively symmetrical in shape, left valva with patch of elongate setae in basal half with setae ca. 0.65 as long as valva, right valva with sparse patch of much shorter setae; a strong, attenuate, incurved projection from valva ca. 0.65 distance

from base to apex, densely clothed with long spiniform setae; basal process of valva about 4 times as long as wide, with linear patch of spines subbasally on inner surface, with blunt tip bearing 3 strong spines. Phallus slightly curved, somewhat flattened distally into lateral flange; cornuti absent. Female genitalia (Fig. 51; 1 preparation examined) with papillae anales unmodified; sterigma a sclerotized plate with a pair of curved flanges submesally, creating a somewhat tubular mesal process split at middle; a pair of narrow sclerotized ridges extending laterad from mesal process; colliculum well sclerotized, funnel-shaped, occupying ca. 0.2 of ductus bursae, remainder of ductus bursae membranous; corpus bursae rounded-oblong; signum a short, weakly curved band with 5–8 short blunt spines of variable size.

Holotype. Male, Peru, Jurimaguas, Mar 1920, Parish (USNM), USNM slide 124,891.

Paratypes (3♂, 6♀). PERU: Jurimaguas, Mar 1920 (3♂, 6♀), Parish (BMNH).

Distribution and Biology. This species is known only from the type locality of Jurimaguas, Peru. Nothing is known of the early stages.

Etymology. The specific epithet refers to the country of the type locality.

4. *Megalota aquilonaris* Brown, new species

Figs. 4, 28, 52

Diagnosis. The forewing of *M. aquilonaris* lacks the pinkish overtones of *M. submicans* and *M. synchysis*. The male genitalia of *M. aquilonaris* are similar to those of *M. vulgaris* but can be distinguished by the nearly symmetrical patches of setae from the basal portions of the valvae (the patch on the right valva is much weaker in *vulgaris*) and the shorter, broader, and less curved phallus, lacking the tiny apical distal thorn. The female genitalia of *M. aquilonaris* can be distinguished from other species of the *submicans* group by the greatly reduced mesal lobe of the lamella postvaginalis.

Description. *Head*: Vertex tawny brown, frons creamy white; labial palpus creamy white with small patches of tawny brown and dark brown. *Thorax*: Dorsum variable from creamy white to tawny brown, usually mixed with some darker brown. Hind tibia in male unmodified, with appressed white scales. Forewing length 6.8–8.2 mm (mean = 7.5); basal 0.3 pale brown, bordered distally by pale region separating basal patch from median fascia; median fascia concolorous with basal patch, with basal and distal edges irregular, broadest at costa forming a subtriangular patch, attenuate or obsolete by lower edge of discal cell; a linear brown band from dorsum ca. 0.75 distance from wing base to termen; a brown semicircular patch from a narrow stalk near mid-termen; entire surface of forewing usually overscaled with pale gray. Fringe brown. Hindwing brown, anal margin in male with fold poorly defined, with a few long scales. *Abdomen*: Brown. Male genitalia (Fig. 28; 4 preparations examined) with tegumen subrectangular, slightly and evenly concave laterally from costa of valva to just before attachment of uncus; uncus cordate with shallow mesal notch, each lobe densely spined; socius ill-defined, membranous; valva essentially symmetrical, although elongate setae from basal portion of left valva slightly longer than those from right; triangular incurved projection from near middle of valva slightly shorter than in other members of species group; basal process of valva as in *submicans*, short, stout, slightly wider in middle, 2.5–3.0 times as long as wide, with 4–5 large spines at blunt distal end. Phallus slightly bent at ca. 0.4 distance from base, comparatively broad throughout, with small sclerotized region ventrally at apex. Female genitalia (Fig. 52; 4 preparations examined) with papillae anales simple, unmodified; sterigma a sclerotized plate with an oval mesal region outlined by narrow line of sclerotization, mesal lobe reduced to narrow crescent-shaped dorsal expansion of sterigma; colliculum strongly sclerotized, extremely short, ca. 0.17 length of ductus bursae; remainder of ductus bursae membranous; corpus bursae elongate-rounded; signum an irregularly rounded, sclerotized patch with 5–6 short blunt spines of variable length and size.

Holotype. Male, Mexico, San Luis Potosí, 25 mi N Tamazunchale, 3–4 Aug 1963, W. Duckworth & D. Davis (USNM), USNM slide 128,801.

Paratypes (7♂, 3♀). MEXICO: **San Luis Potosí**: 25 mi N Tamazunchale, 3–4 Aug 1963 (4♂), W. Duckworth & D. Davis (USNM). El Salto, 8 Aug 1966 (1♂), O. S. Flint (USNM). El Naranjo, El Salto, 29 Jun 1965 (1♂), P. J. Spangler (USNM). **Chiapas**: Río Lacanja, 22 km N Ocosingo, 19 May 1981 (1♀), C. M. & O. S. Flint, Jr. (USNM). **Jalisco**: 2.3 mi E Durazno, 27–29 Dec 1990 (1♀), D. Faulkner & N. Bloomfield (SDNHM). **Veracruz**: Cordoba, 9 Jan 1925 (1♂, 1♀), T. Escalante (USNM).

Additional specimens examined. COSTA RICA: San Pedro de Montes de Oca, r.f. *Croton gossypiifolius* Vahl (CR889), em: 12 Dec 1932 (1♂), C. Ballou (USNM).

Distribution and Biology. This species is recorded from the Mexican states of Chiapas, Jalisco, San Luis Potosí, and Veracruz, which includes both the eastern and western portions of the country. The single worn specimen from Costa Rica deviates slightly in genitalia and forewing maculation from specimens from Mexico, and hence, it is excluded from the type series; it was reared from *Croton gossypiifolius* Vahl (Euphorbiaceae).

Etymology. The specific epithet is Latin for north or northern in reference to the northern distribution of this species.

5. *Megalota vulgaris* Brown, new species

Figs. 5, 29, 53

Diagnosis. *Megalota vulgaris* is superficially similar to its congeners. However, in the male genitalia, the incurved projection near the middle of the valva is slightly broader with a few longer, downward-projecting, spinelike setae from the apex. The basal process of the valva is slightly broader distally, with a truncate tip as in *M. aquilonaris* and *M. submicans*. The patch of elongate setae from the basal half of the valva are significantly weaker in their attachment to the valva than in other species of the group, usually "deciduous" in slide-mounted preparations (n = 11); the setae are rarely dislodged in preparations of the other species. In the female genitalia the anterior edge of the sclerotization of the colliculum is strongly curved, similar to that in *M. submicans* and *M. synchysis*, but the mesal lobe of the lamella postvaginalis is always more slender and symmetrical than in those species. It can be differentiated from *M. peruviana* by its longer, parallel-side colliculum (short and funnel-shaped in *M. peruviana*) and its shield-shaped plate of the lamella postvaginalis with a small, mesal, triangular process.

Description. *Head*: Vertex tawny brown, frons mostly creamy gray; labial palpus creamy gray, with patches of brown and gray-brown. *Thorax*: Dorsum tawny brown mixed with darker brown, with long creamy white scales in distal 0.5 of tegula. Hind tibia in male with expanded patch of elongate, creamy gray sex scales concealing a white hairpencil. Forewing length 6.1–7.1 mm (mean = 6.5); pattern complex, basal 0.5 pale gray brown with irregular, ill-defined, dark brown basal fascia comprised mostly of an elongate dash from near base of wing near dorsum; dark brown triangular patch near mid-costa attenuating just below discal cell, angled toward termen, sometimes extending to dorsum as ill-defined region of darker scales; distal 0.33 of forewing creamy white and shiny gray brown, with an oblique obovate blotch extending from mid-termen toward apex, ending near distal end of discal cell. Fringe brown. Hindwing brown, anal margin in male with fold bearing long, fine, cream-white scales. *Abdomen*: Grayish brown. Male genitalia (Fig. 29; 11 preparations examined) with tegumen subrectangular, dorso-posterior part membranous, expanded dorsally; uncus broadly cordate with extremely shallow notch mesally, each lobe densely spined; socius represented by a membranous digitate lobe; shape of valva and projections from valva nearly symmetrical, elongate setae from basal portion of valva weakly attached (usually lost in slide preparations), those of right valva less dense and shorter; subtriangular incurved projection ca. 0.65 distance from base to apex bearing dense patch of setae, with a few longer, downward-projecting spinelike setae from apex; basal process of valva relatively short, stout, ca. 2.5–3.0 times as long as wide, with 3–4 strong distal spines. Phallus long, slender, curved, with one external thorn api-

cally; vesica with cornuti inconspicuous or absent. Female genitalia (Fig. 53; 24 preparations examined) with papillae anales slender; sterigma shield-shaped, with nearly symmetrical, rounded-triangular lobe in middle posterad of ostium; colliculum sclerotized, occupying posterior 0.25 of ductus bursae, weakly curved at anterior end, remainder of ductus bursae membranous; corpus bursae pear-shaped, finely punctate throughout; signum a small band of short spines from an ill-defined, narrow plate.

Holotype. Male, Costa Rica, Heredia, Estación Biologica La Selva, 50–150 m, 10°26'N, 84°01'W, 9 Feb 2003, D. Wagner (INBio), USNM slide 128,801.

Paratypes (182♂, 53♀). COSTA RICA: **Cartago**: Turrialba, 13–17 Feb 1965 (9♂), 17–21 Feb 1965 (3♂, 1♀), S. S. & D. D. Duckworth (USNM). CATIE, 3 km SE Turrialba, 29–30 May 1985 (1♀), J. Powell & J. Doyen (EME). **Guanacaste**: Est. Pitilla, 9 km S Sta. Cecilia, 700 m, Feb 1993 (1♂), 6–18 Aug 1993 (1♂), Nov 1989 (1♂, 2♀), P. Rios (INBio). Santa Rosa N.P., 12 Dec 1978–10 Jan 1979 (1♂), D. H. Janzen (INBio). **Heredia**: Est. Biologica La Selva, 50–150 m, 10°26'N, 84°01'W, 9 Jan 1993 (3♂), 10 Jan 1993 (2♂, 1♀), 11 Jan 1993 (1♂,1♀), 12 Jan 1993 (2♂), 13 Jan 1993 (3♂), 14 Jan 1993 (3♂), 15 Jan 1993 (1♂), 10–17 Jan 1993 (1♂), 20 Mar 1993 (2♂), 13 Apr 1993 (1♂), 11 Sep 1993 (1♂), 12 Oct 1993 (1♂), 11 Nov 1993 (1♂), 16 Nov 1993 (1♂), 28 Jun 1994 (1♂), 6 Feb 1996 (1♂), 7 Feb 1996 (1♂), 9 Feb 1996 (2♂), 10 Feb 1996 (1♂), 12 Feb 1996 (1♂), 14 Feb 1996 (1♂), 15 Feb 1996 (1♂), 19 Feb 1996 (1♂), 22 Feb 1996 (2♂), 23–29 Feb 1996 (1♂), 4 Mar 1998 (1♂), 13 Mar 1996 (2♂), 25 Mar 1996 (1♀), 27 Mar 1996 (1♂), 29 Apr 1996 (1♂), 10 May 1996 (1♂, 3♀), 12 May 1996 (1♂, 1♀), 14 May 1996 (1♀), 15 May 1996 (1♂,1♀), 16 May 1996 (1♂, 2♀), 17 May 1996 (1♂, 2♀), 18 May 1996 (1♀), 19 May 1996 (2♂), 16 Jan 1998 (4♂, 1♀), 17 Jan 1998 (1♂), 19–30 Jan 1998 (1♂, 1♀), 22 Jan 1998 (2♀), 28 Jan 1998 (3♂,1♀), 3 Feb 1998 (4♂, 1♀), 5 Feb 1998 (1♂), 7 Feb 1998 (1♀), 9 Feb 1998 (2♂), 10 Feb 1998 (1♂), 16 Feb 1998 (2♀), 17 Feb 1998 (2♂), 20 Feb 1998 (1♂), 25 Feb 1998 (1♂), 4 Mar 1998 (2♂), 5 Mar 1998 (2♂), 16 Mar 1998 (1♂), 24 Mar 1998 (2♂), 31 Mar 1998 (1♂), 1 Apr 1998 (2♂, 2♀), 2 Apr 1998 (1♂), 6 Apr 1999 (1♂), 7 Apr 1998 (1♂), 22 Apr 1998 (3♂), 28 Apr 1998 (1♂), 29 Apr 1998 (1♂), 6 May 1998 (1♀), 14 May 1998 (1♂), 20 May 1998 (2♂, 1♀), 26 May 1998 (1♀), 27 May 1998 (1♂), 3 Jun 1998 (1♂), 14 Jul 1998 (1♂), 15 Jul 1998 (1♂), 2 Sep 1998 (1♀), 22 Sep 1998 (1♀), 24 Sep 1998 (1♂), 29 Sep 1998 (1♂), 7 Oct 1998 (1♂), 14 Oct 1998 (1♂), 21 Oct 1998 (1♂), 22 Oct 1998 (1♂), 27 Oct 1998 (1♀), 10 Nov 1998 (1♀), 12 Nov 1998 (1♂), 18 Nov 1998 (1♂), 19 Nov 1998 (1♂), 9 Dec 1998 (1♂), 16 Dec 1998 (2♂), 20 Jan 1999 (1♂), 2 Feb 1999 (1♂), 3 Feb 1999 (1♂), 11 Feb 1999 (1♂), 18 Feb 1999 (1♀), 25 Feb 1999 (1♂), 10 Mar 1999 (1♂), 16 Mar 1999 (2♂, 1♀), 18 Mar 1999 (3♂,1♀), 20 Mar 1999 (1♂), 7 Apr 1999 (2♂), 14 Apr 1999 (1♂), 20 Apr 1999 (1♀), 21 Apr 1999 (1♂), 22 Apr 1999 (3♂, 1♀), 5 May 1999 (1♂), 1 Jun 1999 (1♂), 2 Jun 1999 (1♂), 9 Jun 1999 (3♂), 2–7 Feb 2000 (1♂), 18 Feb 2005 (1♀), 20 Feb 2005 (2♂), OET-INBio-ALAS (all INBio), 22–20 Jan 2000 (1♂), D. Wagner (INBio), 13–23 May 1996 (1♂), 22 Jan 1998 (1♀), 22 Jan 1998 (1♂), 24 Jun 1999 (1♂, 2♀), 25 Jun 1999 (1♂), 26 Jun 1999 (1♀), 28 Jun 1999 (1♂, 1♀), 29 Jun 1999 (2♂), J. Powell (EME), 24–31 Mar 2002 (1♀), A. Y. Kawahara (INBio). 10 km SE La Virgen, ALAS transect, 450–550 m, 14 Feb 2003 (1♂), 19 Feb 2003 (1♂), 21 Mar 2003 (1♂), OET-INBio-ALAS (INBio). Braulio Carrillo N.P., Est. Magsasay, 200 m, Jul 1991 (2♂, 1♀), A. Fernández (INBio). Est. Magsasay, 200 m, May 1991 (1♀), R. Aguilar (INBio). **Limón**: Sector Cerro Cocori, Finca de E. Rojas, 150 m, Nov 1991 (1♂), Jan 1992 (1♂), Mar 1992 (1♀), Jan 1994 (1♂), E. Rojas (INBio). Valle de Estrella, R.B. Hitoy Cerere, E Hitoy Cerere, 100 m, Mar 2001 (1♂), L. Chavarria (INBio). **Puntarenas**: Est. Sirena, P.N. Corcovado, Osa Peninsula, 0–100 m, 5–11 Jan 1981 (1♂), Janzen & Hallwachs (INBio), Dec 1989 (1♂), Oct 1990 (1♂), Dec 1990 (2♂), G. Fonseca, Dec 1991 (2♂), J. C. Saborio, Mar 1991 (1♂), Apr 1991 (1♂), Oct 1991 (1♂), Nov 1991 (1♂), Jan 1994 (1♂), G. Fonseca (all INBio). Rancho Quemado, Osa Peninsula, Jan 1991 (1♂, 1♀), Feb 1992 (1♂), F. Quesada (INBio). Golfito N.P., Piedras Blancas, Est. El Bonito, Alrededor de Est., 100 m, 14–18 Oct 2001 (1♀), H. Mendez (INBio). GUATEMALA: Dept. Izabal: nr Matias de Galvez, 26–27 Jun 1966, (1♂), Flint & Ortiz (USNM).

Distribution and Biology. *Megalota vulgaris* is known from the provinces of Cartago, Guanacaste, Heredia, Limón, and Puntarenas in Costa Rica and from Guatemala. Although the vast majority of specimens are

from lowland rainforest localities below about 200 m, there is a single record from 700 m (Guanacaste). The early stages and larval food plant of *M. vulgaris* are unknown; adults have been collected throughout the year, with many fewer records from June through September.

Etymology. The specific epithet refers to the commonness of the species.

6. *Megalota cacaulana* Brown, new species

Figs. 6, 30

Diagnosis. Superficially, *M. cacaulana* is indistinguishable from its Brazilian congener *M. beckeri* (*delphinosema* group); however, the two are easily distinguished by features of the male genitalia. *M. cacaulana* has a pronounced, irregular, attenuate incurved projection from the valva about 0.75 the distance from the base, bearing a dense patch of long, slightly wavy setae, and the lobes of the uncus are more flattened dorsoventrally, vaguely crescent-shaped. The short, clublike basal process of the valva is extremely similar to that of *M. beckeri*, but the evenly concave lateral sides of the tegumen and the large projection from the distal part of the valva suggest that *M. cacaulana* is a member of the *submicans* group. The female is unknown.

Description. *Head*: Vertex dark brown and red-brown, frons slightly lighter brown; labial palpus brown. *Thorax*: Dorsum brown, with a faint darker lateral band on mesothorax. Hind tibia in male with pronounced sex scaling, white on inner surface, gray on outer surface, with hairpencil. Forewing length 7.5 mm (n = 1); basal 0.5 variegated brown and red-brown; an interrupted, oblique fascia from costa 0.5–0.7 distance from base, with a dark oblique dash at costa; an irregularly oblong-ovate patch in terminal region below apex, extending from near mid-termen to end of discal cell, and from there to dorsum as narrow dark brown line. Fringe brown. Hindwing dark brown, with margin nearly straight from CuA_2 to anal margin; anal margin in male with well-developed, elongate, white sex scales. *Abdomen*: Brown. Male genitalia (Fig. 30; 1 preparation examined) with tegumen subrectangular, concave laterally, with deep rounded indentation at junction of uncus and tegumen; uncus comparatively stout, straight along basal edge, rounded along distal end, lateral lobes separated by a U-shaped gap; socius inconspicuous; valva narrower in middle 0.33; pronounced irregular, attenuate incurved projection from valva ca. 0.75 distance from the base, bearing a dense patch of long, slightly wavy setae; basal process of valva short, stout, twice as long as wide, broadened and somewhat truncate distally, with row of short spines in apico-mesal region and longer, hairlike setae in lateral region. Phallus simple, slightly curved, a trace of an external thorn subdistally on dorsum; vesica without cornutus. Female genitalia unknown.

Holotype. Male, Brazil, Rondônia, Cacaulandia, 140 m, 26–30 May 1998, V. O. Becker (USNM), USNM slide 85,871.

Etymology. The specific epithet is derived from the type locality of Cacaulandia.

7. *Megalota macrosocia* Brown, new species

Figs. 7, 31

Diagnosis. The single specimen of *M. macrosocia* is extremely worn, hence comparisons of the facies with other species are meaningless. The male genitalia are typical of the *submicans* group, with a short, stout, parallel-sided basal process of the valva and a short, broad incurved projection from near the middle of the valva. They can be distinguished from those of other members of the group by the denser patch of much shorter setae in the subbasal group of the left valva, and the large, rounded, pendant socius, the latter of which represents the most conspicuous autapomorphy for the species.

Description. *Head*: Vertex and frons mostly creamy white, labial palpus banded creamy white and brown. *Thorax*: Dorsum creamy white and beige. Hind tibia in male with appressed, flattened, shiny creamy white sex scales, with cream-colored hairpencil. Forewing length 6.2 mm (n = 1); mostly ocherous with scattered tawny brown; darker brown triangular patch from near mid-costa attenuating near lower edge of discal cell; oblique obovate blotch from near mid-termen angled near distal end of discal cell intersecting vertex of triangular patch from costa. Fringe pale brown. Hindwing gray brown, anal margin in male without distinct fold. Fringe pale ocherous. *Abdomen*: Creamy white and beige. Male genitalia (Fig. 31; 1 preparation examined) with tegumen typical of the genus, weakly concave laterally, with small triangular expansion ventrad of attachment of uncus; uncus large with shallow mesal notch, each lobe obovate, densely setose; socius comparatively large, rounded, pendant, free; valva typical of the species group with short, triangular, incurved projection from near middle bearing dense cluster of spiniform setae; subbasal patch a dense cluster of short spiniform setae rather than the patch of elongate setae typical of other members of the group; basal process of valva short, stout, with three small distal spines and a longer one. Phallus short, slightly curved, with a single extremely tiny thorn subbasally at dorsum; cornuti inconspicuous (or absent). Female genitalia unknown.

Holotype. Male, Ecuador, Pichincha, Santo Domingo de los Colorados, 22 Sep 1970, R. E. Dietz (USNM), USNM slide 124,139.

Etymology. The specific epithet refers to the comparatively large socii of this species.

Remarks. Razowski *et al.* (2008) recently described *M. johni* based on a single male from the Galapagos Islands, off the western coast of Ecuador. Although I have not examined the holotype, the images of the adult and genitalia provide ample characters for its identification. The male genitalia of *M. johni* are most similar to those of *M. macroscia*, but those of *M. johni* have a shorter, more curved basal process of the valva bearing a row of long spines, and the notch at the middle of the uncus is extremely shallow.

B. The *delphinosema* group

The *delphinosema* group consists of 15 species. The female genitalia are characterized by a pair of sclerotized, slightly rugose lateral bands that extend from a rounded or subquadrate sclerotized perimeter of the ostium. The strongly sclerotized colliculum comprises about 0.5 or more of the ductus bursae in all but *M. ochreoapex* and *M. simpliciana*. The signum consists of a single, flattened, tongue-shaped or fin-shaped sclerite. Male genitalia in the *delphinosema* group are somewhat variable, but the valva is usually slender in the basal 0.5 and broadened in the distal 0.5, mostly parallel-sided, bearing one or two patches of setae. Usually, one cluster is a circular, dense fascicle of short setae (= cluster of spiniform setae) and the other, usually more basal and more ventral, a patch of more elongate, slender setae (= patch of elongate setae) (see Fig. 37). The basal process of the valva is long and slender, usually smooth and slightly curved along the outer surface and elbowed before the middle on the inner surface. Most species have one or more thornlike spines along the dorsum of the phallus.

Key to the males of the *delphinosema* group based on genitalia

1. Valva with long, transverse, flattened flange 0.6 distance from base to apex (Fig. 33) ..... 9. *spinulosa*
- Valva without flattened flange from valva 2
2. Valva without dense cluster of spiniform setae (Fig. 34) ..... 10. *simpliciana*
- Valva with at least one dense cluster of spiniform setae 3
3. Basal process of the valva short and stout, < 3 times as long as wide (Figs. 45, 47) 4
- Basal process of the valva long and slender, > 3 times as long as wide 5
4. Basal process of the valva ca. 2 times as long as wide, simple, slightly dilated and rounded distally; valva with a single patch of elongate setae in basal 0.25 (Fig. 45) ..... 21. *beckeri*

- Basal process of the valva ca. 2.5 times as long as wide, widest in middle; valva with a small cluster of spiniform setae subbasally and a second patch from ventral edge ca. 0.5 distance from base to apex (Fig. 47).....22. *flintana*

5. Valva with conspicuous basally directed process or spiny lobe near middle, with associated patch of setae near mid-venter, with setae of setal patch longer than 0.25 length of valva (Figs. 38, 44).....6
- Valva without basally directed process or lobe, with setae of setal patch(es) less than 0.25 length of valva.....7

6. Valva with smooth process near middle representing basal edge of abruptly broadened mesal portion of valva, with a patch of elongate slender setae immediately below the process (Fig. 38).....14. *ceratovalva*
- Valva with spiny lobe near middle, with a patch of long flattened, curved setae immediately below lobe (Fig. 44) .....20. *chamelana*

7. Phallus long and slender, ca. 0.7 times length of valva, strongly and evenly curved throughout, with single external thorn at tip; valva with a small triangular flange and associated patch of short spiniform setae near outer edge of basal cavity (Fig. 43) .....19. *gutierrezi*
- Phallus shorter and stouter, < 0.6 times length of valva, weakly curved or angled, with variable number of external spines; valva without triangular flange near outer edge of basal cavity 8

8. Basal process of the valva comparatively stout, length ca. 3 times width, without elbowed bend near middle (Fig. 32) .....8. *ochreoapex*
- Basal process of the valva relatively sender, length > 4 times width, with elbowed bend on inner surface near middle 9

9. Valva with only one patch of setae – a distinct cluster of spiniform setae near middle (Fig. 42) .....18. *crassana*
- Valva with two patches of setae – a distinct cluster of spiniform setae from venter near middle and a second, more basal, patch (or linear region) of finer, sparser setae 10

10. Phallus characteristically angled or bent at ca. 120° at middle; a distinct dorsal thorn at the angle; and vesica with a single large cornutus from a distinct ovoid plate (Fig. 35) .....11. *delphinosema*
- Phallus bent, curved, or angled, but not ca. 120° at middle; one or more dorsal thorns, but not at the point of angle or bend; and vesica with cornuti variable, but not from a distinct ovoid plate 11

11. Setae of subbasal patch longer than setae of spiniform cluster (distal patch) (Fig. 40).....16. *longisetana*
- Setae of subbasal patch shorter than setae of spiniform cluster (distal patch).....12

12. Valva with discrete patch of short, finer setae located basad of cluster of long spiniform setae.....13
- Valva without discrete patch of short, finer setae basad of cluster of long spiniform setae (i.e., fine setae usually scattered throughout subbasal region) 14

13. Setae of subbasal patch about the same length as setae of the spiniform cluster (Fig. 37) .....13. *ricana*
- Setae of subbasal patch much shorter than setae of the spiniform cluster (Fig. 41).....17. *deceptana*

14. Phallus with 3–4 small cornuti (Fig. 39).....15. *bicolorana*
- Phallus with 1–2 larger cornuti (Fig. 36) .....12. *jamaicana*

8. *Megalota ochreoapex* Brown, new species

Figs. 8, 32, 54

Diagnosis. *Megalota ochreoapex* is one of few species of New World *Megalota* that can be distinguished easily based on facies alone. It has two unique elements of the forewing pattern: a pinkish ocherous, crescent-shaped apical region, and a bluish silver patch in the tornus bordered basally by a small, ill-defined white spot. The female genitalia are like those of members of the *submicans* group with the signum in the form of a plate with a group of short blunt sclerites and a short colliculum. However, the male genitalia, with an elongate basal process of the valva and the absence of the patch of elongate setae from the subbasal area of the valva, are typical of the *delphinosema* group. Hence, assignment of this species to either species group is equivocal.

Description. *Head*: Vertex mixed with copper, creamy white, and dark brown, frons pale brown; labial palpus brown, with a small creamy white spot at junction of segments. *Thorax*: Dorsum brown, tegula brown mixed with gray-brown and white; metascutum with well-developed copper tuft. Hind tibia in male with elongate, shiny gray sex scaling concealing creamy white hairpencil. Forewing length 7.0–8.1 mm (mean = 7.8); basal 0.33 mostly dark brown with irregular irrorations, bordered distally by a broad, indistinct, pale brown fascia; apical region bordered by slender crescent-shaped, pinkish ocherous patch; tornus with well-developed

patch of glossy bluish silver with small region of white along basal edge. Fringe brown. Hindwing dark brown, anal margin in male with well-developed fold. *Abdomen*: Glossy grayish brown. Male genitalia (Fig. 32; 3 preparations examined) with tegumen rectangular; uncus broad, comparatively short, with deep rounded dorsal notch; socius inconspicuous; valva symmetrical, narrow, with dense cluster of short spiniform setae near middle, second patch of longer, finer setae at venter slightly apicad of spiniform cluster at basal termination of narrow distal portion of valva, third tiny patch of short setae in basal 0.33 of valva; basal process of valva relatively straight, without elbowed bend, sparse longer hairs near middle, attenuate and densely spined in distal ca. 0.2. Phallus with two minute external spines, one near tip, one ca. mid-length; vesica with one or two small, slender cornuti. Female genitalia (Fig. 54; 1 preparation examined) with papillae anales simple; sterigma an angular band with broad, triangular arch mesally; colliculum broad, strongly sclerotized, occupying posterior 0.25 of ductus bursae, remainder of ductus bursae membranous; corpus bursae rounded-oblong; signum a small irregularly sclerotized patch with narrow band of short blunt spines.

Holotype. Male, Costa Rica, Cartago, Turrialba, 22–28 Feb 1965, S. S. & D. D. Duckworth (USNM), USNM slide 95,354.

Paratypes (8♂, 1♀). COSTA RICA: **Cartago**: Turrialba, 17–21 Feb 1965 (3♂), 22–28 Feb 1965 (2♂), S. S. & D. D. Duckworth (USNM). **Alajuela**: Area de Conservacion Guanacaste, Rincon Rainforest, Camino Río Francia, 410 m, 01-SRNP-4119, 17 Jan 2001, em: 30 Jan 2001 (1♂), r.f. *Croton billbergianus*, J. Perez (USNM). **Guanacaste**: Area de Conservacion Guanacaste, Sector del Oro, Chon, 280 m, 05-SRNP-20479, 27 Jan 2005, em: 12 Feb 2005 (1♂), r.f. *Croton billbergianus*, E. Cantillano (USNM). Area de Conservacion Guanacaste, Sector Pitillas, Amonias, 390 m, 06-SRNP-30879, 13 Feb 2006, em: 7 Mar 2006 (1♀), r.f. *Croton billbergianus*, C. Moraga (USNM). **San José**: Est. Carrillo, P.N. Braulio Carrillo, 700 m, Jul 1990 (1♀), I Curso Microlepid. (INBio). PANAMA: Porto Bello, Mar 1911 (1♂), A. Busck (USNM).

Distribution and Biology. *Megalota ochreoapex* is known from Turrialba, Braulio Carrillo, and Area de Conservación Guancaste, Costa Rica, and Porto Bello, Panama, all of which are below 700 m elevation and support lowland tropical rainforest. Two males were reared from *Croton billbergianus* Müll. Arg. (Euphorbiaceae) at Area de Conservación Guanacaste (Janzen & Hallwachs 2007).

Etymology. The specific epithet refers to the ocherous patch of the forewing apex.

9. *Megalota spinulosa* Brown, new species

Figs. 9, 33, 55

Diagnosis. Adults of *M. spinulosa* are superficially similar to most congeners, but the forewing maculation is slightly darker. Males are easily distinguished from the similar and sympatric *M. vulgaris* by the distinct anal roll of the hindwing, which is poorly developed or absent in the latter. The male genitalia are easily distinguished by the comparatively small uncus; the relatively straight basal process of the valva; the conspicuous, narrow, flangelike projection from the valva about 0.65 the distance from the base; and the absence of spiniform setae from the basal 0.5 of the valva. The female genitalia are characterized by a rugose bandlike sterigma with a trapezoidal mesal lobe and a sclerotized colliculum that occupies the posterior 0.6 of the ductus bursae.

Description. *Head*: Vertex mostly brown with some tawny brown, frons tawny brown; labial palpus tawny brown to creamy white, with small areas of brown and red brown. *Thorax*: Dorsum brown and tawny brown; metascutum with tuft of bronze brown scales. Hind tibia in male with dense patch of white sex scales concealing hairpencil. Forewing length 6.0–7.0 mm (mean = 6.5); ground color reticulated brown and tawny brown, with lesser amounts of pinkish ocherous and red brown; ill-defined region of gray and creamy white scales separating basal blotch from median fascia; median fascia ill-defined, dark brown at costa, fading to olive brown at dorsum; oblique blotch arched from mid-termen, intersecting median fascia near distal end of discal cell, bordered by silvery gray. Fringe brown. Hindwing dark brown, anal margin in male with well-

developed roll bearing sex scales. *Abdomen*: Shiny bronze gray. Male genitalia (Fig. 33; 6 preparations examined) with tegumen subrectangular, slightly narrowed dorsally, with weak triangular expansion immediately before junction with uncus; uncus somewhat rounded, comparatively short, only slightly wider than tegumen; socius membranous, inconspicuous; valva parallel-sided, slightly more narrow in distal 0.33, with slender, attenuate flange ca. 0.65 distance from base to apex, with patch of elongate setae from venter of valva just basad of flange; basal process of valva rather broad, straight, as in *ochreoapex*, without elbow, attenuate and spined in distal 0.2. Phallus rather short, curved, with a short external subdorsal thorn subapically; vesica with two cornuti, one short and stout, the other twice as long, slender. Female genitalia (Fig. 55; 4 preparations examined) with papillae anales relatively broad; sterigma a parallel-sided, spinulose band, divided mesally by invaginated, subrectangular lobe with blunt posterior end; colliculum lightly sclerotized, occupying posterior ca. 0.6 of ductus bursae, with pair of long, strongly sclerotized internal struts along edge of ductus bursae, one ca. 0.9 length of colliculum, the other ca. 0.7 length of colliculum; remainder of ductus bursae membranous; corpus bursae rounded-oblong; signum a subrectangular, finlike plate from a small, ill-defined base.

Holotype. Male, Costa Rica, Heredia, La Selva Biological Station, 10°26N, 84°01W, 9 Feb 2003, MV light, D. Wagner (INBio), USNM slide 95,334.

Paratypes (147♂, 15♀). COSTA RICA: **Cartago:** Turrialba, 13–17 Mar 1965 (8♂), 17–21 Feb 1965 (4♂), S. S. & W. D. Duckworth (USNM). CATIE, 3 km SE Turrialba, 600 m, 15 May 1985 (1♀), J. Chemsak (EME), 29–30 May 1985 (1♀), J. Powell & J. Doyen (EME). **Guanacaste**: Est. Pitilla, 9 km S Santa Cecilia, 700 m, 12–30 Jan 1993 (1♂), C. Moraga, 6–18 Aug 1993 (1♂), P. Rios (INBio). **Heredia**: Est. Biologica La Selva, 10°25N, 84°01W, 50–150 m, 9 Jan 1993 (3♂), 10 Jan 1993 (3♂), 10–17 Jan 1993 (1♂), 11 Jan 1993 (1♂), 12 Jan 1993 (2♂, 1♀), 13 Jan 1993 (3♂), 14 Jan 1993 (3♂), 15 Jan 1993 (1♂), 20 Mar 1993 (2♂), 30 Mar 1993 (1♂), 13 Apr 1993 (1♂), 11 Sep 1993 (1♂), 12 Oct 1993 (1♂), 11 Nov 1993 (1♂), 27 Jun 1994 (1♀), 28 Jun 1994 (1♂), 5 Feb 1996 (1♀), 6 Feb 1996 (1♂), 7 Feb 1996 (1♂), 10 Feb 1996 (1♂), 12 Feb 1996 (1♂), 15 Feb 1996 (1♂, 1♀), 19 Feb 1996 (1♂), 22 Feb 1996 (1♂), 13 Mar 1996 (1♂), 17 Mar 1996 (1♂), 10 May 1996 (1♂), 12 May 1996 (1♂), 13 May 1996 (1♂), 17 May 1996 (1♂), 20 May 1996 (2♂), 16 Jan 1998 (4♂), 17 Jan 1998 (1♂), 19–30 Jan 1998 (2♂, 1♀), 28 Jan 1998 (2♂, 1♀), 3 Feb 1998 (3♂), 5 Feb 1998 (1♂), 9 Feb 1998 (2♂), 10 Feb 1998 (1♂, 1♀), 17 Feb 1998 (2♂), 25 Feb 1998 (1♂, 1♀), 4 Mar 1998 (3♂), 5 Mar 1998 (1♂), 16 Mar 1998 (1♂), 24 Mar 1998 (2♂), 1 Apr 1998 (1♂), 2 Apr 1998 (1♂), 22 Apr 1998 (4♂), 29 Apr 1998 (1♂), 12 May 1998 (1♀), 27 May 1998 (1♂), 14 Jul 1998 (1♂), 14 Oct 1998 (1♂), 21 Oct 1998 (1♂), 22 Oct 1998 (1♂), 12 Nov 1998 (1♂), 16 Nov 1998 (1♂), 18 Nov 1998 (1♂), 19 Nov 1998 (1♂), 9 Dec 1998 (1♂), 15 Dec 1998 (1♂, 1♀), 16 Dec 1998 (1♂), 20 Jan 1999 (1♂), 2 Feb 1999 (1♂), 16 Mar 1999 (2♂), 18 Mar 1999 (1♂), 23 Mar 1999 (1♂), 7 Apr 1999 (2♂), 14 Apr 1999 (1♂), 22 Apr 1999 (2♂), 5 May 1999 (1♂), 1 Jun 1999 (1♂), 9 Jun 1999 (3♂), 22–29 Jan 2000 (1♂, 1♀), 19 Feb 2003 (1♂), INBio-OET-ALAS (all INBio). 10 km SE La Virgen, 10°20N, 84°05W, 450–550 m, 14 Feb 2003 (1♂), 19 Feb 2003 (1♂), 20 Feb 2003 (1♂), 21 Mar 2003 (1♂), 23–29 Feb 2004 (1♂), 7 Mar 2006 (1♂), INBio-OET-ALAS transect (all INBio), 17 Jan 1998 (2♂), J. Powell (EME), 27–28 Mar 1992 (2♂), J. McCarty & J. Powell (EME). 11 km ESE La Virgen, 250–350 m, 10°21'N, 84°03'W, 19 Mar 2004 (1♀), INBio-OET-ALAS transect (INBio). Braulio Carrillo N.P., Est. Magsasay, 200 m, Jan 1991 (2♂), R. Aguilar (INBio). **Limón**: Valle de la Estrella, R.B. Hitoy Cerere, E. Hitoy Cerere, 100 m, Mar 2001 (1♂), L. Chavarria (INBio). Sector Cerro Cocori, Finca de E. Rojas, 150 m, Nov 1991 (1♂), Jan 1992 (1♂), E. Rojas (INBio). **Puntarenas**: Est. Sirena, P.N. Corcovado, Oso Peninsula, 0-100 m, 5–11 Jan 1981 (1♂), D. Janzen & W. Hallwachs (INBio), Oct 1990 (1♂), Dec 1990 (2♂), Mar 1991 (1♂), Apr 1991 (1♂), Oct 1991 (1♂), Nov 1991 (1♂), Jan 1994 (1♂), G. Fonseca (all INBio), Dec 1991 (2♂), J. C. Saborio (INBio). VENEZUELA: **Yaracuy**: Yurubi N.P., 20 km SE Yumare, 9 Mar 1978 (1♂), J. B. Heppner (USNM). **Aragua:** Rancho Grande, 1100 m, 16–23 Oct 1966 (1♂, 1♀), 11–15 Jan 1966 (1♂), S. S. & W. D. Duckworth (USNM).

Distribution and Biology. This species is known from the Costa Rican provinces of Heredia and Puntarenas below 500 m elevation, and from the Venezuelan provinces of Yaracuy and Aragua at slightly higher ele-

vations. It is recorded throughout much of the year, but records are absent from January-February and July. Nothing is known of the early stages.

Etymology. The species name refers to the flangelike spine on the valva of the male genitalia.

10. *Megalota simpliciana* Brown, new species

Figs. 10, 34, 56

Diagnosis. *Megalota simpliciana* is superficially similar to other congeners, but usually can be distinguished by subtle features of the forewing pattern. In fresh specimens there frequently is a small, narrow, pale or white longitudinal streak from the distal edge of the median fascia in the discal cell that is lacking in other species. Also, the narrow, bar-shaped patch from the basal portion of the dorsum of the forewing frequently is interrupted in the middle, isolating a small, dark brown dot near the middle of the basal 0.25 of the wing. The male genitalia are easily distinguished by the following features: an extremely shallow notch at mid-dorsum of the bilobed uncus, the absence of the patches of setae from the valva, and a slightly club-shaped distal end of the basal process of the valva. The female genitalia are easily distinguished by the subquadrate ostium and the short colliculum with a rounded, membranous expansion of the ductus bursae immediately anterad.

Description. *Head*: Vertex dark copper-brown, frons brown; labial palpus mixed pale copper, creamy white, and pale brown. *Thorax*: Dorsum mostly brown, lighter posteriorly; tegula well defined, pale brown and copper; metascutum with dark copper-brown tuft. Hind tibia in male densely covered by long gray scales concealing hairpencil. Forewing length 6.8–8.1 mm (mean = 7.7); basal 0.3 separated from distal 0.4 by an oblique red-brown median fascia extending from ca. mid-costa to dorsum, broadening slightly toward dorsum, relatively straight, well defined along basal edge, irregularly undulate along distal edge with distinct rounded tooth near middle; basal 0.25 of wing pale pinkish gray-brown with faint indication of basal patch; a small, distinct, dark brown, bar-shaped patch from the basal portion of the dorsum, frequently interrupted in middle, isolating a small, dark brown dot near middle of basal 0.25 of wing; an oblong, slightly arched, red-brown patch extending from mid-termen toward costa, ending bluntly before reaching costa. Fringe orange brown. Hindwing brown, anal margin in male with well-developed fold bearing long, fine dark scales. *Abdomen*: Dark fuscous. Male genitalia (Fig. 34; 7 preparations examined) with tegumen subrectangular; uncus broad, densely spined, with extremely shallow mid-dorsal notch; socius inconspicuous; valva simple, nearly parallel-sided throughout, rounded apically, with small triangular flange near middle of venter, spiniform setal patches absent; basal process of valva slightly curved near middle with distal end slightly expanded, rounded, with small patch of short spines. Phallus evenly sclerotized throughout, curved, a single small external spine at dorsum apically; vesica with one long, slender cornutus. Female genitalia (Fig. 56; 3 preparations examined) with sterigma subrectangular surrounding ostium, with a distinct, sclerotized band extending dorso-laterad from each posterior corner; colliculum short, sclerotized, about twice as long as wide, with semi-sclerotized, rounded sac at anterior portion of colliculum, remainder of ductus bursae membranous; corpus bursae large, ovate, lacking spinules, with a stout, shark-finlike signum from a small irregular plate.

Holotype. Male, Costa Rica, Cartago, Turrialba, 1–6 Mar 1965, S. S. & D. D. Duckworth (USNM), USNM slide 95,338.

Paratypes (36♂, 12♀). COSTA RICA: **Alujuela**: 4 km W Santa Cecilia, 250 m, 25 Feb 1985 (1♀), D. Janzen & W. Hallwachs (INBio). Area de Conservacion Guanacaste, Sector San Cristobal, Finca San Gabriel, 645 m, 05-SRNP-6729, 24 Oct 2005, em: 9 Nov 2005 (1♂), 05-SRNP-6730, em: 8 Nov 2005 (1♀), r.f. *Croton schiedeanus*, C. Cano (USNM). **Guanacaste**: Area de Conservacion Guanacaste, Sector Pitilla, Pasmompa, 440 m, 03-SRNP-20903, 4 Sep 2003, em: 21 Sep 2003 (1♂), 03-SRNP-20904, em: 23 Sep 2003 (1♀), 03-SRNP-20905, em: 11 Sep 2003 (1♂), 03-SRNP-20978, em: 24 Sep 2003 (1♂), all r.f. *Croton schiedeanus*, P. Rios (USNM). Area de Conservacion Guanacaste, Sector del Oro, Margarita, 380 m, 05-SRNP-21023, 4 Mar

2005, em: 15 Mar 2005 (1♀), r.f. unknown plant, L. Rios (USNM). **Cartago**: Turrialba, 17–21 Feb 1965 (1♂), 13–17 March 1965 (1♂), S. S. & D. D. Duckworth (USNM). **Heredia**: Est. Biologica La Selva, 50–150 m, 10°26N, 84°01W, UV light, 12 Jan 1993 (1♀), 18 Sep 1993 (2♂), 13 Jan 1994 (1♂), 5 Feb 1996 (1♂), 12 Feb 1996 (1♂), 15 Feb 1996 (1♂), 11 May 1996 (1♂), 15 May 1996 (1♂), 9 Dec 1996 (1♂), 22 Jan 1998 (1♂), 26 Jan 1998 (1♂), 4 Mar 1998 (1♂), 24 Mar 1998 (1♂), 6 Dec 1998 (1♀), 9 Dec 1998 (3♂), 9 Feb 1999 (1♂), 2 Feb 1999 (1♂), 18 Mar 1999 (1♂, 1♀), 22–29 Jan 2000 (1♀), 22–23 Mar 2001 (1♂), 7 Feb 2002 (1♂), 16-17 Feb 2002 (1♂), INBio-OET-ALAS (all INBio). 11 km SE La Virgen, 10°20'N, 84°04'W, 450–550 m, 23 Feb 2003 (1♂), INBio-OET-ALAS (INBio). **Limón**: Sector Cerro Cocori, Finca de E. Rojas, 150 m, 31 Jan–21 Feb 1992 (1♂), E. Rojas (INBio). **Puntarenas**: Est. Sirena, Corcovado National Park, Oso Peninsula, 0–100 m, 5–11 Jan 1981 (5♂, 2♀), Mar 1991 (1♂), D. Janzen & W. Hallwachs (INBio). Quepos, P.N. Manuel Antonio, Sep 1992 (1♀), Dec 1993 (1♀), G. Varela (INBio).

Distribution and Biology. *Megalota simpliciana* is known from the Costa Rican provinces of Cartago, Guanacaste, Heredia, Limón, and Puntarenas, at elevations below 500 m. Five specimens were reared at Santa Rosa National Park from larvae collected on *Croton schiedeanus* Schldl. (Euphorbiaceae) (Janzen & Hallwachs 2007).

Etymology. The specific epithet refers to the simple valva lacking the ornamentation of most species in the genus.

11. *Megalota delphinosema* (Walsingham), new combination

Figs. 11, 35, 57

Olethreutes delphinosema Walsingham, 1914: 250.
"*Olethreutes*" *delphinosema*: Powell *et al*. 1995: 153.
"Olethreutinae Unplaced Species" *delphinosema*: Brown 2005: 447.

Diagnosis. Superficially, *M. delphinosema* is weakly distinguished from its congeners by the presence of an ill-defined semicircular patch of pale brown to pinkish brown just before mid-dorsum of the forewing, bordered basally by a short, dark brown, oblique narrow-triangular dash from the dorsum, and distally by the median fascia; the pale patch is frequently less defined in females. The male genitalia are very similar to those of *M. ricana*, *M. bicolorana*, *M. longisetana*, and *M. jamaicana* on the basis of the position of the patches of setae on the valva. However, *M. delphinosema* can be distinguished easily from those species by the phallus, which is bent at 120° at the middle where there is a single large dorsal thorn; the vesica has a single large cornutus from a distinctly ovoid plate.

Redescription. *Head*: Vertex copper and creamy white, frons creamy white; labial palpus creamy white on basal portion, copper brown in distal portion. *Thorax*: Dorsum mixed red-brown and pinkish cream-colored, metascutum with large copper tuft. Hind tibia in male with expanded gray-brown scaling concealing hairpencil. Forewing length 6.8–7.5 mm (mean = 7.3); vaguely two-toned, with paler basal 0.5 and darker distal 0.5, females sometimes less two-toned; ground color pale brown to pinkish brown in basal 0.5; short, dark brown, oblique narrow-triangular dash from dorsum ca. 0.1 distance from base; dark red-brown median fascia from mid-costa to dorsum, moderately well defined along basal margin, less defined along distal margin, usually with small pinkish cream-colored indentation in discal cell; an oblong blotch arching from mid-termen toward distal edge of median fascia. Fringe pale red-brown. Hindwing uniformly pale brown, anal margin in male with well-developed roll of sex scales. Fringe concolorous with wing. *Abdomen*: Brown. Male genitalia (Fig. 35; 9 preparations examined) with tegumen subrectanglar, lateral portions slightly convex from base of valva to just before attachment of uncus; uncus broad, each lobe kidney bean-shaped, densely spined; socius ill-defined, membranous; valva somewhat parallel-sided, shallowly concave subbasally, slightly attenuate in distal 0.15; cluster of spiniform setae near venter 0.5 distance from base to apex; subbasal patch of elongate setae ill-defined, represented by few scattered setae between spiniform cluster and lower edge of basal con-

cavity; basal process of valva relatively long, 4–5 times as long as wide, elbowed just before middle on inner side, tip with short spines. Phallus short, stout, bent at 120° at middle from which a large, erect, dorsal thorn arises; vesica with a single cornutus from an ovoid, disk-shaped plate. Female genitalia (Fig. 57; 9 preparations examined) with papillae anales unmodified; sterigma a narrow band, with V-shaped elevation mesally, weakly attached to sclerotized perimeter of ostium; colliculum long, slightly more than 0.5 length of ductus bursae, moderately sclerotized, with pair of more strongly sclerotized, longitudinal struts; corpus bursae oblong, signum in the form of a parallel-sided, tonguelike sclerite from an irregularly semicircular, sclerotized base.

Holotype. Female, Guatemala, Solol, Volcan de Atitlan, 2500–3500', 1881, Champion (BMNH).

Specimens Examined (60♂, 18♀). COSTA RICA: **Alajuela**: Finca Campana, 5 km NW Dos Rios, 750 m, 21 Mar 1985 (2♂), D. Janzen & W. Hallwachs (INBio). **Cartago**: Turrialba, 13–17 Mar (6♂), 1–6 Mar 1965 (1♂), 17–21 Feb 1965 (3♂), 22–28 Feb 1965 (2♂, 1♀), S. S. & W. D. Duckworth (USNM). CATIE, 3 km SE Turrialba, 600 m, 16 May 1985 (1♂), J. Powell (EME). Las Cruces, near San Vito, 19–20 Mar 1965 (1♂), S. S. & W. D. Duckworth (USNM). **Guanacaste**: Santa Rosa National Park, 16–18 Jul 1979 (1♀), 2–4 May 1980 (1♂), D. Janzen (INBio). 2 km W Santa Cecilia, 25 Dec 1984 (1♂), D. Janzen & W. Hallwachs (INBio). Est. Pitilla, 9 km S Santa Cecilia, 700 m, 4–13 Dec 1991 (1♂), Jun 1991 (1♂), Oct 1994 (1♀), C. Moraga (INBio). Finca Pasmompa, Est. Pitilla, 5 km SW Santa Cecilia, Dec 1990 (1♂), P. Rios & C. Moraga (INBio). **Heredia**: Est. Biologica La Selva, 50–150 m, 10°26'N, 84°01W, 16 Apr 1996 (1♂), 14 Apr 1998 (1♂), 24 Feb 1999 (1♂), 13 Apr 1999 (1♂), 22 Jul 1998 (1♂), 22–29 Jan 2000 (1♂, 1♀), INBio-OET-ALAS (INBio), 24–31 Mar 2002 (1♂), A. Kawahara (INBio), 18 Feb 2003 (1♂), 7 Mar 2006 (1♂), D. Wagner (INBio). 10 km SE La Virgen, 10°20'N, 84°05'W, 450–550 m, 12 Feb 2003 (1♂), 22 Feb 2003 (1♂), 17–23 Mar 2003 (3♂), 11 Apr 2003 (1♂), INBio-OET-ALAS transect (all INBio). Puerto Viejo de Sarapiqui, Finca La Selva (OTS), 6–9 Mar 1985 (1♂), D. H. Janzen & W. Hallwachs (INBio). **Limón**: Pococi, Finca INBio, 300 m, 26–29 Sep 2000 (1♂), E. Phillips (INBio). **Puntarenas**: Monteverde, 1400 m, 12 Jun 1988 (1♀), J. Brown & J. Powell (EME). VENEZUELA: **Aragua**: Rancho Grande, 1100 m, 16–23 Oct 1966 (17♂, 9♀), 1–5 Nov 1966 (3♂), 24–31 Oct 1966 (1♂, 1♀), 11–15 Jan 1966 (1♂, 2♀), S. S. & W. D. Duckworth (USNM). Miranda, P.N. Guatopo, 24 km N Altagra, 640 m, 5–9 May 1975 (1♀), J. Salcedo & R. E. Dietz (USNM).

Distribution and Biology. *Megalota delphinosema* is recorded from Guatemala to Venezuela, and from sea level to about 1100 m (Rancho Grande). Although its distribution is relatively broad compared to that documented for other New World congeners, many Costa Rican tortricids exhibit similar patterns of distribution, ranging from Guatemala to Venezuela.

12. *Megalota jamaicana* Brown, new species

Figs. 12, 36

Diagnosis. A single male from Jamaica has genitalia (Fig. 36) that are mostly indistinguishable from those of *M. delphinosema*, but its phallus lacks the 120° bend at the middle and the associated long dorsal thorn characteristic of the latter species (Fig. 35). In addition, the forewing pattern is relatively distinct (Fig. 12): there is a pale creamy pink area of ground color between the basal and median subbasal fasciae that extends uninterrupted from the costa to the dorsum; the distal 0.6 of the wing is nearly uniformlyly brown; and the hindwing is pale gray, brown along the perimeter, unlike any other species in the genus.

Description. *Head*: Vertex copper and red brown, frons creamy white; labial palpus creamy white in basal portion, copper brown in distal portion. *Thorax*: Dorsum red-brown, metascutum with large copper tuft. Hind tibia in male with expanded silky white scaling concealing hairpencil. Forewing length 7.0 mm; basal patch red-brown in costal 0.5, confluent with dark brown triangular blotch at dorsum; a pale creamy pink submedian fascia extending from costa to dorsum; distal 0.6 of wing mostly brown, obscuring typical forewing markings

represented by a trace; diffuse orange-red subapical patch. Fringe brown. Hindwing uniformly pale gray, brown along perimeter; anal margin in male with well-developed roll of sex scales. Fringe pale brown. *Abdomen*: Brown. Male genitalia (Fig. 36; 1 preparation examined) with tegumen elongate-subrectanglar, lateral sides nearly straight, with small lobelike expansion just before attachment of uncus; uncus broad, each lobe kidney bean-shaped, densely spined; socius membranous, pendant, subrectangular; valva somewhat parallel-sided, narrowed just beyond middle, slightly attenuate in distal 0.15; cluster of spiniform setae near venter ca. 0.5 distance from base to apex; subbasal patch of elongate setae ill-defined, represented by fine scattered setae between spiniform cluster and lower edge of basal concavity; basal process of valva relatively long, 4–5 times as long as wide, curved-elbowed near middle, a patch of 5 long setae on inner surface near middle, distal 0.2 with dense patch of short spines. Phallus ca. 0.5 as long as valva, gently curved throughout, with a few tiny serrations in distal 0.25; vesica with two cornuti: one broad from an irregular, sclerotized, C-shaped base, the other one slender, needlelike, from small rounded base. Female genitalia unknown.

Holotype. Male, Jamaica, Portland Parish, 4 mi S Hartford, 850', 26–27 Apr 1973, D. & M. Davis (USNM), USNM slide 124,108.

Etymology. The specific epithet refers to the country from which this species is described.

Remarks. In contrast to *M. submicans*, which appears to be fairly widespread in the Caribbean, *M. jamaicana* is known only from Jamaica.

13. *Megalota ricana* Brown, new species

Figs. 13, 37, 58

Diagnosis. *Megalota ricana* is superficially and morphologically most similar to *M. bicolorana* and *M. delphinosema*. The male genitalia of *M. ricana* can be distinguished from those of *M. bicolorana* by the shallow notch at the dorsum of the uncus (Fig. 37), which is much deeper in *M. bicolorana* (Fig. 39), and by the presence of one or two cornuti in the vesica compared to the three cornuti of *M. bicolorana*. The male of *M. delphinosema* (Fig. 35) is easily distinguished by the characteristically bent phallus.

Description. *Head*: Vertex pale pink brown, frons creamy white; labial palpus creamy white in basal and ventral 0.5, red-brown in distal 0.5. *Thorax*: Dorsum pale red brown, metascutum with copper brown tuft. Hind tibia in male with dense brush of creamy white scales concealing hairpencil. Forewing length 7.0–7.5 mm (mean = 7.2); vaguely two-toned, with pale basal region and darker distal region; basal 0.5 pale red ocherous with paler semicircular patch near mid-dorsum; variably developed, dark brown, triangular dash near base of dorsum; distal 0.5 dark brown and red brown, median fascia, representing basal edge of distal 0.5, darker, usually uninterrupted from costa to dorsum, tornal region reddish brown, bordered apically by oblong blotch extending from mid-termen to distal end of discal cell, with narrow, curved extension intersecting median fascia near its middle; subapical region with pale brownish pink bar bordering costal edge of oblong blotch. Fringe brown. Hindwing uniformly brown, anal margin in male with well-developed roll of sex scales. Fringe pale brown. *Abdomen*: Pale red brown. Male genitalia (Fig. 37; 5 preparations examined) with tegumen subrectanglar, lateral portions nearly straight, subparallel, slightly narrowed dorsally; uncus broad with shallow dorsal notch, each lobe kidney bean-shaped, densely spined; socius membranous, inconspicuous; valva somewhat parallel-sided, slightly attenuate in distal 0.15; cluster of spiniform setae near venter ca. 0.5 distance from base to apex; subbasal patch of elongate setae situated just basad of spiniform cluster; basal process of valva long, slender, ca. 5 times as long as wide, elbowed ca. 0.4 distance from base on inner side, tip with short spines. Phallus short, weakly curved throughout, with one or two small dorsal thorns between ca. 0.33 and 0.25 from apex; vesica with one or two cornuti, one moderate in size from a small rounded sclerite, the other (sometimes lacking or inconspicuous) shorter and narrower, from smaller rounded basal sclerite. Female genitalia (Fig. 58; 1 preparation examined) with papillae anales comparatively broad; sterigma a sclerotized

band, slightly narrowed mesally at junction with ostium; colliculum long, straight, slightly greater than 0.5 length of ductus bursae, with strongly sclerotized lateral edges; remainder of ductus bursae membranous; corpus bursae round, finely punctate, with signum in form of weakly curved, fin-shaped sclerite from an irregularly semicircular sclerotized base.

Holotype. Male, Costa Rica, Puntarenas, Est. Sirena, P.N. Corcovado, Osa Peninsula, 0–100 m, 5–11 Jan 1981, D. Janzen & W. Hallwachs (INBio), USNM slide 124,540.

Paratypes (20♂, 1♀). COSTA RICA: **Alajuela**: N slope Volcán de Rincon, 2 km W Dos Rios, 550 m, 22 May 1985 (1♂), J. Powell & P. Opler (EME). **Cartago**: Turrialba, Grano de Oro, Chirripo, 1120 m, Aug 1993 (1♂), P. Campos (INBio). CATIE, 3 km SE Turrialba, 600 m, 16 May 1985 (1♂), J. Powell (EME). **Guanacaste**: Est. Pitilla, 9 km S Santa Cecilia, 700 m, Mar 1989 (1♂), Dec 1989 (1♂), 11–30 Jan 1993 (1♂), all P. Rios (INBio). Est. Maritza, lado oeste del Volcán Orosi, Jul 1990 (3♂), Aug 1990 (1♂), I Curso Microlepid. (INBio). Area de Conservación Guanacaste, Sector Pitilla, Pasmompa, 440 m, 03-SRNP-20902, 4 Sep 2003, em: 22 Sep 2003 (1♂), r.f., *Croton schiedeanus*, P. Rios (USNM). Area de Conservación Guanacaste, Sector Santa Rosa, Quebrada, 275 m, 92-SRNP-3189, 13 Jul 1992, em: 29 Jul 1992 (1♂), r.f. *Croton niveus*, gusañeros (USNM). Area de Conservación Guanacaste, Sector del Oro, Quebrada Trigal, 290 m, 04-SRNP-25739, 23 Oct 2004, em: 7 Nov 2004 (1♂), 04-SRNP-25738, em: 8 Nov 2004 (1♂), r.f. *Croton schiedeanus*, E. Cantillano (USNM). **Heredia:** Finca La Selva (OTS), Puerto Viejo de Sarapiqui, 6–9 Mar 1985 (1♂), D. H. Janzen & W. Hallwachs (INBio). Est. Magsasay, P.N. Braulio Carrillo, 200 m, Apr (1♀), R. Aguillar (INBio). **Puntarenas**: Est. Sirena, P.N. Corcovado, Osa Peninsula, 0–100 m, Dec 1990 (2♂), Mar 1991 (1♂), Apr 1991 (1♂), G. Fonseca (INBio). Rancho Quemado, Peninsula de Osa, 200 m, Feb 1992 (1♂), F. Quesada (INBio).

Distribution and Biology. This species is known from Alajuela, Cartago, Heredia, and Guanacaste provinces, Costa Rica, between 200 and 700 m elevation. Janzen & Hallwachs (2007) reared one specimen from *Croton niveus* Jacq. and four from *Croton schiedeanus* Schltdl. (Euphorbiaceae).

Etymology. The specific epithet refers, in part, to the country in which the species was collected - Costa Rica; "rica" means rich.

14. *Megalota ceratovalva* Brown, new species

Figs. 14, 38

Diagnosis. This is one of few species of *Megalota* that can be distinguished on the basis of facies alone. The forewing is mottled charcoal, with a small, narrow, irregular patch of gray iridescent scales extending from the tornus to the distal end of the discal cell, and an arched orange subapical patch bordered basally by a gray iridescent line. The male genitalia are easily recognized by a rounded, horn-shaped process near mid-valva representing the basal edge of the abruptly broadened mesal portion of valva, and an associated patch of setae from large sockets immediately below the horn, with the setae ca. 0.4–0.5 as long as the valva.

Description. *Head*: Vertex mostly red brown with some dark brown; labial palpus creamy white basally, blackish brown distally. *Thorax*: Dorsum dark red brown and charcoal. Hind tibia in male with well-developed, bushy, pale gray sex scaling concealing creamy white hairpencil. Forewing length 5.7 mm (n = 1); forewing [somewhat rubbed] mottled charcoal and dark brown, ill-defined darker area near mid-costa representing costal remnant of median fascia; small, narrow, irregular patch of gray, slightly iridescent scales in subterminal area, extending from tornus to distal end of discal cell; arched, orange subapical patch bordered basally by gray, slightly iridescent line and costally by two pairs of white strigulae. *Abdomen*: Charcoal. Male genitalia (Fig. 38; 1 preparation examined) with tegumen obovate with small triangular expansion immediately ventrad of attachment with uncus; uncus comparatively narrow, each lobe kidney bean-shaped and their longitudinal axes subparallel, densely spined; socius extremely small, digitate, membranous, pendant; valva abruptly broadened near middle with rounded, horn-shaped truncation representing basal edge of expansion; a

dense cluster of long spiniform setae immediately ventrad of truncation, with setae ca. 0.4–0.5 as long as valva; subbasal patch of setae ill-defined or absent; basal process of valva ca. 4 times as long as wide, elbowed slightly basad of middle on inner side, tip slightly swollen, with short spines. Phallus short, stout, slightly bent near middle, without external thorns; vesica with 4 short, slender cornuti. Female genitalia unknown.

Holotype. Male, Venezuela, T. F. Amazonas, 29 km S Puerto Ayacucho, 17 Nov 1987, P. J. Spangler & R. A. Faitoute, collected in malaise trap (USNM), USNM slide 124,496.

Etymology. The specific name comes from the Greek "cerato", meaning horn, and refers to the horn-shaped process from the middle of the valva.

15. *Megalota bicolorana* Brown, new species

Figs. 15, 39, 59

Diagnosis. *Megalota bicolorana* is among the larger species (forewing length 8.0–9.0 mm), with a forewing that has a pale basal half and a darker distal half similar to that of *M. deceptana*, *M. ricana*, and *M. longisetana*. The male genitalia of *M. bicolorana* (Fig. 39) are most similar to those of *M. ricana* (Fig. 37) but lack the subbasal patch of slender setae, instead having sparse, short, fine setae throughout the area between the cluster of spiniform setae at mid-valva and the ventral edge of the basal excavation of the valva. Also, the phallus of *M. bicolorana* usually has 3–4 small cornuti in contrast to the single larger cornutus of *M. ricana*. The female genitalia of *M. bicolorana* (Fig. 59) are most similar to those of *M. longisetana* (Fig. 60) but can be distinguished by the longer colliculum which is curved to the right anteriorly, and the more pronounced mesal process of the sterigma.

Description. *Head*: Vertex red brown, frons creamy white; labial palpus creamy white in basal 0.5, red brown in distal 0.5. *Thorax*: Dorsum pale orange, metascutum with red brown tuft. Hind tibia in male with well-developed, bushy, silky white sex scales concealing white hairpencil. Forewing length 8.0–9.0 mm (mean = 8.5); two-toned, with basal ca. 0.5 pale orange brown and distal ca. 0.5 dark brown and red brown; median fascia dark brown, usually uninterrupted between costa and dorsum, well defined along basal edge, irregular and less defined along distal edge, region from distal end of discal cell to forewing apex irregularly variegated with pinkish brown, orange, and brown, with a narrow, grayish iridescent line subapically; oblong blotch from mid-termen ill-defined; pale brown, triangular dash from dorsum ca. 0.15 distance from base to tornus. Fringe brown, paler at tornus. Hindwing uniformly brown, anal margin in male with well-developed roll of white sex scales. Fringe pale brown. *Abdomen*: Red brown. Male genitalia (Fig. 39; 2 preparations examined) with tegumen subrectangular with rounded-triangular expansion just before junction with uncus; uncus broad, with deep, narrowly V-shaped notch at mid-dorsum, each lobe bean-shaped, densely spined, their longitudinal axes forming obtuse angle; socius tiny, digitate, pendant; valva mostly parallel-sided, conspicuously narrower in distal 0.4, dense cluster of spiniform setae from venter ca. 0.6 distance from base, patch of elongate setae ill-defined, represented by area of sparse short fine setae; basal process of valva ca. 5 times as long as wide, elbowed at ca. 0.33 distance from base to tip, with short spines in distal 0.25 and longer, finer setae in mesal portion. Phallus curved near middle with a large dorsal thorn ca. 0.75 distance from base to apex, and a tiny thorn subapically; vesica with 3–4 small, slender cornuti. Female genitalia (Fig. 59; 2 preparations examined) with papillae anales simple, slipper-shaped; sterigma a moderately sclerotized band with shallow-lobed, mesal, subtriangular process attached to narrow sclerotized rim of ostium; colliculum occupying posterior 0.5 of ductus bursae, strongly sclerotized in its posterior 0.33, less sclerotized in anterior 0.67, curved to right anteriorly; anterior 0.5 of ductus bursae membranous; corpus bursae oblong-ovoid; signum a curved, tongue-shaped sclerite from ill-defined base.

Holotype. Male, Costa Rica, Guanacaste, Est. Pitilla, 9 km S Santa Cecilia, 700 m, Mar 1994, P. Rios (INBio), USNM slide 84,863.

Paratypes (3♂, 1♀). COSTA RICA: **Alajuela**: Finca Campana, 5 km NW Dos Rios, 750 m, 21 Mar 1985 (1♂), D. Janzen & W. Hallwachs (INBio). Area de Conservación Guanacaste, Sector San Cristobal, Sendero Perdido, 620 m, 05-SRNP-4878, 19 Aug 2005, em: 3 Sep 2005 (1♂), r.f. *Croton schiedeanus*, G. Sihezar (USNM). **Guanacaste**: Est. Pitilla, 9 km S Santa Cecilia, 700 m, Mar 1991 (1♂), 11–30 Jan 1993 (1♀), P. Rios (INBio).

Distribution and Biology. This species appears to be confined to Costa Rica; it has been recorded from Alajuela and Guanacaste provinces, between 620 and 750 m elevation. It has been reared once from *Croton schiedeanus* Schltdl. (Euphorbiaceae).

Etymology. The specific epithet refers to the somewhat two-toned aspect of the forewing pattern.

16. *Megalota longisetana* Brown, new species

Figs. 16, 40, 60

Diagnosis. In facies and genitalia, *M. longisetana* is most similar to three Costa Rican congeners: *M. deceptana*, *M. ricana*, and *M. bicolorana*. The male genitalia are distinguished by the configuration of the patch of elongate setae of the valva immediately basad of the cluster of spiniform setae (Fig. 40), in which the setae are conspicuously longer than those of *M. deceptana*, *M. ricana*, and *M. bicolorana*, and the absence of cornuti in the vesica. The female genitalia of *M. longisetana* are most similar to those of *M. bicolorana* but can be distinguished by the slightly shorter colliculum, the smaller mesal process of the sterigma, and the shorter signum that is broader basally than that of *M. bicolorana*.

Description. *Head*: Vertex red brown, frons creamy white; labial palpus creamy white in basal 0.5, red brown in distal 0.5. *Thorax*: Dorsum pale orange, metascutum with red brown tuft. Hind tibia in male with well-developed, bushy, silky white sex scales concealing white hairpencil. Forewing length 8.0–9.0 mm (mean = 8.5); vaguely two-toned, with basal 0.5 pale orange brown, distal 0.5 dark brown and red brown, median fascia dark brown, uninterrupted from costa to dorsum, moderately well defined along basal edge, irregularly sinuate along distal edge; tornal region much lighter; brown oblong blotch from mid-termen extending to distal end of discal cell. Fringe brown, paler at tornus. Hindwing uniformly brown, anal margin in male with well-developed anal roll of white sex scales. Fringe pale brown. Male genitalia (Fig. 40; 2 preparations examined) with tegumen subrectangular, slightly undulate laterally, with rounded-triangular expansion just before junction with uncus; uncus broad, with broadly V-shaped notch at mid-dorsum; socius inconspicuous; valva mostly parallel-sided, narrower in distal 0.4, dense cluster of spiniform setae from venter ca. 0.6 distance from base, patch of elongate setae well defined from venter ca. 0.40–0.45 distance from base to apex, with setae about 0.25 as long as valva; basal process of valva 5–6 times as long as wide, elbowed just before middle, with short spines in distal 0.2. Phallus somewhat curved-undulate dorsally, with an erect dorsal thorn ca. 0.75 distance from base to apex, and a tiny thorn subapically, slightly dorso-laterad; vesica lacking cornuti. Female genitalia (Fig. 60; 1 preparation examined) with papillae anales simple, slender; sterigma a moderately sclerotized band interrupted with lobelike posterior expansion of ostium mesally; colliculum occupying posterior 0.5 of ductus bursae, strongly sclerotized along edges, less sclerotized in middle, remainder of ductus bursae membranous; corpus bursae oblong-ovoid; signum a curved, fin-shaped sclerite from wide ill-defined base.

Holotype. Male, Costa Rica, Cartago, Turrialba, 13–17 Mar 1965, S. S. & W. D. Duckworth (USNM), USNM slide 84,894.

Paratypes (1♂, 1♀). COSTA RICA: **Cartago**: Moravia de Chirripo, 1000 m, 10 May 1983 (1♂), D. Janzen & W. Hallwachs (INBio). **Puntarenas**: Finca Cafrosa, Est. Las Mellizas, P.N. Amistad, 1300 m, Oct 1989 (1♀), M. Ramirez & G. Mora (INBio).

Distribution and Biology. The few specimens available suggest that this is a species of the middle elevations (1000-1300 m) of Costa Rica. Nothing is known of the life history.

Etymology. The specific epithet refers to the patch of elongate setae from the venter of the valva in the male genitalia.

17. *Megalota deceptana* Brown, new species

Figs. 17, 41, 61

Diagnosis. In facies and genitalia, *M. deceptana* is most similar to *M. longisetana*, *M. ricana*, and *M. bicolorana*. The male genitalia are distinguished by the relative positions of the setae on the valva, with the cluster of spiniform setae from the venter of the valva ca. 0.6 the distance from the base to the apex and a second patch of finer hairlike setae, 0.5 the length of the spiniform setae, located just basad and slightly dorsad. Also, the basal process of the valva is conspicuously spined throughout its length. The phallus has a single slender cornutus as in *M. ricana*. In the female genitalia the band-shaped sterigma is more broadened mesally to the point of attachment with the ostium than in other species.

Description. *Head*: Vertex red brown, frons creamy white; labial palpus creamy white in basal 0.5, red brown in distal 0.5. *Thorax*: Dorsum mixed orange and brown, metascutum with darker red brown tuft. Hind tibia in male with well-developed, bushy, silky white sex scales concealing white hairpencil. Forewing length 8.0–9.0 mm (mean = 8.5); vaguely two-toned, basal ca. 0.5 pale red brown, distal 0.5 dark brown and red brown, median fascia dark brown at costa, fading to red-brown at dorsum; dark brown triangular dash from dorsum ca. 0.15 distance from base to tornus, extending to median fascia as a narrow, ill-defined blotch; subterminal area pale brown, somewhat variegated with pinkish brown and brown; oblong blotch from mid-termen ill-defined, arched near distal end of discal cell, intersecting median fascia near middle of wing. Fringe brown, paler at tornus. Hindwing uniformly brown, anal margin in male with well-developed roll of white sex scales. Fringe pale brown. Male genitalia (Fig. 41; 5 preparations examined) with tegumen subrectangular, narrow, with slight indentation just before junction with uncus; uncus broad with deep notch dorsally, each lobe somewhat egg-shaped, densely spined; socius present as small, membranous semicircular lobe; valva straight as in *bicolorana*, cluster of spiniform setae from venter ca. 0.6 distance from base to apex, second cluster of much shorter, hairlike setae slightly basad and dorsad of first; basal process of valva 5–6 times as long as wide, elbowed at ca. 0.4 length, with conspicuous long spines along entire length. Phallus short, broad, weakly curved; vesica with a single slender cornutus from a small, asymmetrical, platelike base. Female genitalia (Fig. 61; 5 preparations examined) with papillae anales simple, unmodified; sterigma a moderately sclerotized band interrupted mesally, except for slender posterior edge, by ovoid ostium with narrowly sclerotized rim; colliculum occupying slightly less than posterior 0.5 of ductus bursae, with irregularly sclerotized internal edges, remainder of ductus bursae membranous; corpus bursae oblong-ovoid, signum a curved, fin-shaped sclerite from weakly sclerotized base.

Holotype. Male, Costa Rica, Alajuela, Sector San Ramon, 13–28 Mar 1994, K. Taylor (INBio), USNM slide 85,867.

Paratypes (8♂, 6♀). COSTA RICA: **Alajuela**: N slope Volcan de Rincon, 2 km W Dos Rios, 22 May 1985 (4♂, 3♀), J. Powell & P. Opler (EME). Finca San Gabriel, 2 km SW Dos Rios, 600 m, May 1989 (1♀), GNP Biodiv. Survey (INBio). Finca San Gabriel, 16 km E Quebrada Grande, 630 m, 8 Feb 1983 (1♂), D. Janzen & W. Hallwachs (INBio). Sector San Ramon, 620 m, 13–28 Mar 1994 (1♂), D. Garcia (INBio). Rio Sarapiqui, 2 km SE Cariblanco, 700 m, 28 Mar 1992 (1♂), McCarty & Powell (EME). **Cartago**: Turrialba, 1–6 Mar 1965 (1♂), S.S. & W. D. Duckworth (USNM). **Guanacaste**: Zona Protection Tenorio, Sector Alto dos Masís, 1100 m, 10–14 Jun 2002 (2♀), E. Phillips & J. Jiménez (INBio).

Distribution and Biology. This species has been recorded from the Costa Rican provinces of Alajuela, Cartago, and Guanacaste, on the western slope of the central cordillera, between about 600 and 1200 m elevation. Adults have been collected from February through June. Nothing is known of the early stages.

Etymology. The specific epithet, *deceptana*, is from the Latin *decipio* or *deceptus*, and refers to the fact that I initially confused this species with two superficially similar species.

18. *Megalota crassana* Brown, new species

Figs. 18, 42, 62

Diagnosis. *Megalota crassana* is superficially similar to *M. gutierrezi*, *M. deceptana*, and *M. bicolorana*, but in fresh specimens there is an ill-defined, brownish olivaceous triangular patch near mid-dorsum that is absent in those species. The male has a bushy hind tibia and associated hairpencil that is primarily dark gray compared to the mostly cream-colored tuft of *M. gutierrezi*, *M. bicolorana*, and *M. deceptana*. The male genitalia of *M. crassana* have a single large, dense cluster of spiniform setae near mid-valva and lack the secondary patch of elongate setae that subtends the spiniform patch in *M. gutierrezi*, *M. deceptana*, and *M. bicolorana*. The phallus of *M. crassana* lacks external thorns, whereas that of *M. gutierrezi* has a single apical thorn, *M. deceptana* has a single subapical thorn, and *M. bicolorana* has a submesal thorn and occasionally a tiny subapical thorn. The female genitalia of *M. crassana* have a small, rounded-triangular lobe at the posterior edge of the ostium lacking in *M. gutierrezi*, *M. deceptana*, and *M. bicolorana*, and the signum is considerably smaller than in those three species.

Description. *Head*: Vertex pinkish brown, frons creamy white with white spot at lower edge; labial palpus mixed creamy white, pinkish brown, and dark brown. *Thorax*: Dorsum pale creamy brown with glossy gray-brown scaling on tegula; metascutum with well-developed, copper scale tuft. Hind tibia in male with dense, dark gray, modified sex scaling and hairpencil. Forewing length 7.5–8.0 mm (mean = 7.8); basal 0.33 somewhat checkered dark brown, pinkish brown, and copper, bordered distally by a pale, ill-defined, oblique fascia, broadest at dorsum, with olive and creamy white scales; a dark semicircular patch at costa between ca. 0.45 and 0.75 distance from base to apex; a small, slender, oblong brown patch near mid-termen approaching costa ca. 0.75 from base to apex, ending bluntly before reaching costa; tornus with patch of shiny pale pinkish brown scales. Fringe brown. Hindwing dark brown, anal margin in male with distinct fold bearing long, slender, cream-colored scales. *Abdomen*: Glossy gray brown. Male genitalia (Fig. 42; 3 preparations examined) with tegumen subrectangular, slightly narrowed dorso-posteriorly, with lobelike expansion just before junction with uncus; uncus large, bilobed, with deep mid-dorsal notch; valva with irregular, angulate expansion near middle; cluster of spiniform setae ca. 0.5 distance from base to apex, with setae comparatively thick, short, converging distally; second patch of setae absent; basal process of valva slender, about 6 times as long as wide, elbowed near middle on inner surface, weakly spined from elbow to apex, strongly spined apically. Phallus only slightly curved, without external thorns; vesica with a single small cornutus. Female genitalia (Fig. 62; 2 preparations examined) with papillae anales simple, unmodified; sterigma a narrow, ill-defined band restricted to meso-ventral region, with a small triangular lobe with rounded apex mesally; colliculum occupying slightly less than posterior 0.5 of ductus bursae, with long, strongly sclerotized region on right side, remainder of ductus bursae membranous; corpus bursae oblong-round, signum a short, triangular sclerite, with rounded vertex, lacking sclerotized base.

Holotype. Male, Costa Rica, Alajuela Province, Area de Conservación Guanacaste, Rincon Rainforest, Camino Río Francia, 410 m, 02-SRNP-6698, 13 Mar 2002, em: 28 Mar 2002, r.f. unknown plant, J. Perez (USNM), USNM slide 95,342.

Paratypes (7♂, 3♀). COSTA RICA: **Alajuela**: Area Conservación de Guanacaste, Rincon Rainforest, 02-SRNP-6697, 13 Mar 2002, em: 26 Mar 2002 (1♀), 02-SRNP-6696, em: 25 Mar 2002 (1♀), r.f. unknown

plant, 03-SRNP-10778, 16 Apr 2003, em: 5 May 2003 (1♂), 05-SRNP-40407, 3 Feb 2005, em: 22 Feb 2005 (1♂), 05-SRNP-40408, em: 25 Feb 2005 (1♂), both r.f. *Croton billbergianus*, J. Perez (USNM). Area Conservación de Guanacaste, Sector Pitilla, Pasmompa, 03-SRNP-21032, 4 Sep 2003, em: 25 Sep 2003 (1♀), r.f. *Croton billbergianus*, C. Moraga, 03-SRNP-20907, 4 Sep 2003, em: 29 Sep 2003 (1♂), r.f. *Croton billbergianus*, P. Rios (USNM). **Guanacaste**: Area Conservación de Guanacaste, Sector Pitilla, Amonias, 390 m, 06-SRNP-30881, 13 Feb 2006, em: 7 Mar 2006 (1♂), r.f. *Croton billbergianus*, C. Moraga (USNM). **Puntarenas**: Est. Quebrada Bonita, Res. Biol. Carara, 50 m, Jan 1991 (1♂), R. Zuniga (INBio).

Other Material Examined. PANAMA: Porto Bello, Dec 1912 (1♂), A. Busck (USNM).

Distribution and Biology. This species is recorded from the Pacific slope of Costa Rica and adjacent Panama. With the exception of the single specimen from Panama, the entire type series was reared from *Croton billbergianus* Müll. Arg. (Euphorbiaceae) (or an unknown plant, presumably *Croton*) at Area de Conservación Guanascaste (Janzen and Hallwachs 2007).

Remarks. While the phallus usually is extremely uniformly within species of *Megalota*, that of the specimen from Panama deviates from its putative conspecifics in having two groups of three cornuti in contrast to the single cornutus in all other specimens (all from Costa Rica). However, because the Panamanian specimen agrees well in all other features, it is included under *M. crassana* but not included in the type series.

Etymology. The specific epithet is from the Latin "crass" meaning dense or thick, and refers to the dense cluster of spiniform setae on the valva.

19. *Megalota gutierrezi* Brown, new species

Figs. 19, 43, 63

Diagnosis. *Megalota gutierrezi* is a comparatively large species, superficially similar to *M. crassana*, *M. bicolorana*, and *M. deceptana* but with the dark mark from mid-termen distinctly triangular. The male genitalia are easily distinguished by the broad basal portion of the valva with a small, angulate, subtriangular process near the venter immediately distad of the basal cavity. Also, the two groups of spiniform setae, usually distinct and separate clusters in congeners, are more or less continuous along the venter of the basal portion of the valva from the subtriangular process to about 0.6 the distance to the apex, where the valva becomes narrower. The phallus of *M. gutierrezi* is long, slender, and curved throughout, with a single small erect thorn at the tip, whereas the aedeagi of *M. bicolorana* and *M. deceptana* are shorter and broader, and have one or more erect thorns from the dorsum before the tip, and *M. crassana* lacks thorns altogether. The female genitalia of *M. gutierrezi* are easily distinguished by the small, deeply U-shaped emargination at the ventro-posterior edge of the ostium and the semi-membranous, bulbous enlargement of the ductus bursae immediately anterad of the colliculum.

Description. *Head*: Vertex reddish brown and creamy white, frons creamy white; labial palpus mixed creamy white and dark brown. *Thorax*: Dorsum pale brown and rust; metascutum with well-developed maroon scale tuft. Hind tibia in male with dense, cream-colored, modified sex scaling and hairpencil. Forewing length 8.5–9.5 mm (mean = 9.1); basal 0.33 somewhat checkered dark brown, pinkish brown, and copper, bordered distally by a pale, ill-defined, oblique fascia; a dark semicircular patch at mid-costa, with a paler, less defined extension to dorsum; small, dark brown, subtriangular patch in subterminal region immediately apicad of distal end of discal cell; tornal region pale brown. Fringe brown. Hindwing brown, anal margin in male with distinct fold bearing long, slender, cream-colored scales. *Abdomen*: Brown. Male genitalia (Fig. 43; 3 preparations examined) with tegumen broad, subrectangular, slightly narrowed in dorsal 0.3, with lobe-like expansion extremely weak; uncus broad with wide U-shaped notch dorsally, each lobe obovate, densely spined; valva broad in basal 0.6, about twice as broad as distal 0.4; small dense cluster of spiniform setae and accompanying small triangular process near venter at lower-outer edge of basal cavity of valva, with irregu-

larly linear patch of spiniform setae continuous with basal spiniform cluster along venter to abruptly narrowed point of valva; basal process of valva 4–5 times as long as wide, irregularly expanded beyond middle, lacking distinct elbow, with attenuate tip. Phallus long, ca. 0.65 length of valva, evenly curved throughout, with distal, slightly upturned thorn; vesica with a single slender cornutus. Female genitalia (Fig. 63; 2 preparations examined) with papillae anales simple, unmodified; sterigma in the form of a narrow ill-defined band; ostium with small, deeply U-shaped emargination; colliculum slightly less than 0.5 length of ductus bursae, strongly sclerotized except for narrow longitudinal mesal portion, remainder of ductus bursae membranous, with bulbous enlargement immediately anterad of the colliculum; corpus bursae narrow pear-shaped; signum in the form of a narrow tongue-shaped sclerite from a broad, irregular base.

Holotype. Male, Costa Rica, Puntarenas, Monteverde, 1400 m, 29–31 Mar 1992, S. Meredith & J. Powell (EME), USNM slide 84,888.

Paratypes (9♂, 3♀). COSTA RICA: **Puntarenas**: Monteverde, 1400 m, 26 Mar 1987 (1♀), W. E. Steiner (USNM), 22–24 Jul 1990 (1♂, 1♀), S. Meredith & J. Powell (EME), 29–31 Mar 1992 (1♂, 1♀), S. McCarty & J. Powell (EME), 8–10 Jun 1986 (1♂), J. Chemsak & H. Katsura (EME). Monteverde Cloud Forest Reserve Headquarters, 1450 m, 18 May 1985 (6♂), J. Powell, P. Opler & J. Chemsak (EME).

Distribution and Biology. This species is known only from cloud forest habitat in the vicinity of Monteverde, Costa Rica. Capture records include March (n = 4), May (n = 6), June (n = 1), and July (n = 2). Nothing is known of the early stages.

Etymology. This species is named for Dr. Mario Gutiérrez in recognition of his work in the field of genetics and his generous support of the scientific activities of INBio.

20. *Megalota chamelana* Brown, new species

Figs. 20, 44

Diagnosis. The forewing ground color of *M. chamelana* is gray brown, considerably paler than that of most species in the genus; it also is smaller than most species in the *delphinosema* group. The male genitalia (Fig. 44) are easily distinguished by the dense cluster of large, flattened, spiniform setae from the meso-ventral portion of the valva, somewhat reminiscent of the setae of the Nearctic genus *Proteoteras* Riley (Eucosmini), and the associated wartlike projection near the middle of the valva, both of which are interpreted as autapomorphies.

Description. *Head*: Vertex pale copper and tawny brown, frons whitish gray; labial palpus mixed pale gray and tawny brown. *Thorax*: Dorsum mixed brown, tawny brown, and pale gray, metascutum with dark red-brown tuft. Hind tibia in male with large, expanded tuft of pale gray scales, becoming white distally, with a dense fascicle of elongate cream-colored scales (hairpencil) in middle. Forewing length 5.5–7.0 mm (mean = 6.3); basal 0.5 mostly uniformly pale tawny brown, variegated with darker scales, a few tiny patches of dark brown in basal 0.25; oblique, brown median fascia from costa about 0.45–0.55 distance from base to apex, usually ending or becoming less defined just below lower edge of discal cell, with distinct short dash toward termen; oblong, oblique, brown patch from ca. mid-termen intersecting dash from median fascia. Fringe brown. Hindwing nearly uniformly brown, slightly paler in basal region, anal margin in male with well-developed fold of long white to cream-colored scales. *Abdomen*: Brown. Male genitalia (Fig. 44; 4 preparations examined) with tegumen subrectangular, rounded dorsally before attachment with uncus, with distinct rounded lateral indentation between tegumen and uncus; uncus lobes semicircular, separated by broad, shallow, v-shaped notch; socius inconspicuous; valva nearly parallel-sided with setose wart-shaped expansion near middle; dense cluster of large, flattened, spiniform setae from meso-ventral portion of valva below wart-shaped expansion; small patch of short setae immediately basad of wart-shaped expansion; basal process of valva about 4 times as long as wide, slightly elbowed near middle on outer edge, with dense patch of short

spines in distal 0.2. Phallus slightly curved, with a single external dorsal thorn near middle; vesica with a single slender cornutus. Female genitalia unknown (single female with abdomen missing).

Holotype. Male, Mexico, San Luis Potosí, 2 mi N Tamazunchale, 400' [125 m], 2 Aug 1963, D. Duckworth & D. Davis (USNM), USNM slide 124,512.

Paratypes (7♂, 2♀). MEXICO: **Colima**: 13 mi N Manzanillo, microondas Turo, 24–26 Dec 1988 (3♂, 1♀), N. Bloomfield (SDNHM). **Jalisco**: Est. Biologica Chamela, 16–19 Oct 1987 (2♂), 21–22 Oct 1987 (1♂), J. Chemsak & J. Powell (EME). **San Luis Potosí**: 2 mi N Tamazunchale, 400', 2 Aug 1963 (1♂), D. Duckworth & D. Davis (USNM). **Tamaulipas**: Guemes, 28 Jun 1965 (1♀), P. J. Spangler (USNM).

Distribution and Biology. This species is known from the Mexican states of Colima, Jalisco, and Tamaulipas, suggesting a rather broad range from the west-central to the northeastern portions of the country. The early stages are unknown.

Etymology. The species name is derived from the collecting locality of Chamela, Mexico

21. *Megalota beckeri* Brown, new species

Figs. 21, 45

Diagnosis. In facies, *M. beckeri* is similar to many congeners, however, the forewing ground color is slightly darker than most. Also, the edge of the hindwing has a rounded concavity between 1A+2A and the anal margin that is either much less pronounced or absent in other species of *Megalota*. The male genitalia are easily distinguished by the short, stout basal process of the valva with a densely spined distal region; the distinctive configuration of the lobes of the uncus, forming a somewhat V-shaped process; and the absence of the cluster of spiniform setae at mid-valva. Although the basal process of the valva is similar to that of *M. cacaulana*, other features of the genitalia suggest that the two are not closely related.

Description. *Head*: Vertex, frons, and labial palpi red-brown and creamy white. *Thorax*: Dorsum brown, metascutum with weak crest, brown with creamy white-tipped scales. Hind tibia in male with dense sex scales, white on inner surface of tibia, tawny gray on outer surface, concealing hairpencil. Forewing length 7.0–7.5 mm (mean = 7.3); basal 0.5 variegated brown and dark red-brown, with some scattered creamy white scales; an ill-defined, incomplete, oblique fascia from costa 0.5–0.7 distance from base, darkest in costal region, roughly forming a triangular patch; an irregularly oblong-ovate patch in terminal region below apex, extending to dorsum near termen as dark brown band of nearly uniformly width. Fringe brown. Hindwing brown, anal margin in male with well-developed, elongate roll of pale creamy white sex scales. *Abdomen*: Brown. Male genitalia (Fig. 45; 3 preparations examined) with tegumen rectangular, lacking conspicuous dorsal lobes, uncus lobes forming V-shaped 90° angle, lobes nearly straight along anterior edge, rounded in posterior portion; socius ill defined, membranous; valva straight, moderately uniformly in width in distal 0.65, with a distinct notch along venter ca. 0.35 distance from base; a sparse patch of long, straight setae from conspicuous sockets subbasally from venter of valva; basal process of valva short, stout, club-shaped, ca. twice as long as wide, rounded apically, slightly narrowed basally, with dense spines in distal 0.35. Phallus curved near middle, with dorsal hump subapically; cornuti absent. Female genitalia unknown.

Holotype. Male, Brazil, Minas Gerais, Sete Lagoas, 720 m, Apr 1974, V. O. Becker (USNM), USNM slide 124,145.

Paratypes (2♂). BRAZIL: **Minas Gerais**: Nova Lima, 850 m, 8–9 Oct 1985 (1♂), S. E. Miller (USNM). **São Paulo**: São Paulo, 900 m, 3–7 Jan 1983 (1♂), V. O. Becker (VBC).

Etymology. This species is named for my friend and colleague Vitor Becker, whose knowledge of Neotropical Lepidoptera is exceeded by none.

22. *Megalota flintana* Brown, new species

Figs. 23, 47

Diagnosis. Superficially, *M. flintana* is similar to many smaller species of *Megalota*, such as *M. chamelana*; the only well-defined forewing pattern elements are confined to the region from mid-costa and mid-termen to the apex. *Megalota flintana* can be distinguished by several unique features of the male genitalia: the basal process of the valva has an attenuate, spined, accessory lobe subapically; the basal patch of spiniform setae is bordered distally by a narrow sclerotized ridge; and the vesica has a distinctly triangular cornutus rather than the thorn or spinelike cornuti of other species.

Description. *Head*: Vertex creamy white with pale brown laterally, frons pale creamy orange; labial palpus mostly creamy white with pale brown distally on second segment, third segment mostly cream-colored. *Thorax*: Dorsum brown mixed with pale copper and creamy white, metascutum with brown tuft. Hind tibia in male with broad patch of large, flattened, mostly appressed, shiny white sex scales concealing hairpencil. Forewing length 7.7 mm; basal 0.5 pale ocherous, variegated with specks of pale and darker brown; red-brown triangular patch from costa ca. 0.45–0.55 distance from forewing base to apex, with apex of triangular patch curved distad at lower edge of discal cell toward termen, patch continuing to dorsum as faded, oblique median fascia; an oblong red-brown blotch in apico-subterminal region, expanded towards apical termination of triangular patch. Fringe mostly brown with some red-brown scales. Hindwing uniformly pale gray-brown, anal margin in male without distinct patch of sex scales. *Abdomen*: Pale gray-brown. Male genitalia (Fig. 47; 1 preparation examined) with tegumen rectangular, lacking conspicuous dorsal lobes; uncus lobes large, rounded, densely spined; valva narrow, nearly parallel-sided; basal patch of spiniform setae arranged perpendicular to long axis of valva, overlaying a small triangular flange, bordered distally and dorsally by a narrow sclerotized ridge; second patch of spiniform setae from venter near mid-valva; basal process of valva short, 2.0–2.5 times as long as wide, widened mesally, with attenuate, spined, accessory lobe subapically. Phallus curved at 0.3 length from base to tip, with tiny subdorsal and subapical thorns; vesica with distinctly triangular cornutus. Female genitalia unknown.

Holotype. Male, Brazil, Rio de Janiero, Nova Friburgo, municipal water supply, 24 Apr 1977, C. M. & O. S. Flint, Jr. (USNM), USNM slide 124,500.

Etymology. This species is named for Oliver Flint, Jr., a noted neuropterist and trichopterist and the collector of the holotype.

C. The *plenana* group

The divergent male genitalia of *M. plenana* inhibit its confident placement in either of the proposed informal species groups. The basal process of the valva is extraordinarily long, longer than the valva, with an unusual pointed process apically; the uncus is strongly flattened; and the valva is short and narrow. Discovery of the female likely will help resolve the taxonomic position of the species.

23. *Megalota plenana* (Walker), new combination

Figs. 22, 46

Carpocapsa plenana Walker, 1863: 397 (description).
"*Olethreutes*" *plenana*: Powell *et al*. 1995: 153 (checklist).
"Olethreutinae Unplaced Species" *plenana*: Brown 2005: 448 (catalog).

Diagnosis. *Megalota plenana* is superficially similar to other species in the genus, but its male genitalia (Fig. 46) are highly divergent from those of its congeners. The uncus is modified distally into a pair of elongate,

flattened process, the valva is extremely short and narrow, and the basal process of the valva is sinuate and nearly 1.5 times as long as the valva.

Redescription. *Head*: Vertex, frons, and labial palpus ferruginous. *Thorax*: Dorsum ferruginous with three faint cinereous bands, metascutum with brown tuft. Hind tibia in male without expanded scaling and hairpencil. Forewing length 7.0 mm (n = 1); irregularly variegated with ferruginous and rust; a darker, ill-defined subbasal fascia from costa to dorsum; a darker, slightly undulating, median fascia from costa to dorsum, bordered distally and basally by narrower, ill-defined, pale areas; a narrow dark brown dash extending from mid-termen towards costa. Fringe ferruginous. Hindwing brown, anal margin in male with a patch of long, white sex scales. *Abdomen*: Brown. Male genitalia (Fig. 46; 2 preparations examined) with tegumen subrectangular, with triangular dorsal lobes; uncus broad, shorter than that of congeners, with densely setose, elongate, flattened distal portion; remnant of gnathos a weakly sclerotized band with elongate mesal process truncate apically; valva short, slender; basal process of valva extremely long, longer than valva, sinuate, with row of 4 spines at ca. 0.6 distance from base and curved spine at apex. Phallus stout, gently curved, expanded distally, terminating in flange-shaped process roughened on dorsum in distal 0.25; vesica with a single large slender cornutus. Female genitalia unknown.

Lectotype (hereby designated). Male, Brazil, Amazonas, Ega (BMNH). Because of the potential confusion of this species with *Carpocapsa incultana*, a lectotype is necessary in order to stabilize the nomenclature and identity of *M. plenana*.

Lectoparatype. Brazil, Amazonas, Ega, (1♂) (BMNH), BMNH slide 31,397.

Remarks. Powell *et al*. (1995) listed *Carpocapsa incultana* Walker as a synonym of *plenana*, the latter of which they included in "*Olethreutes*" [unplaced], and this treatment was followed by Brown (2005). However, based on the female genitalia of the type of *incultana* (BMNH), it is highly unlikely that it is congeneric with other species of *Megalota*. Hence, although *Megalota plenana* becomes a new combination, *incultana* is retained in "unplaced Olethreutinae" for the present.

D. The *pastranai* group

As with *Megalota plenana*, the highly divergent male genitalia of *M. pastranai* inhibit its confident placement in either of the proposed species groups, and it is possible that it requires a separate genus. Superficially, the male lacks the modified anal region of the hindwing characteristic of most species in the genus. The discovery of the female may help resolve its taxonomic position.

24. *Megalota pastranai* Brown, new species

Figs. 24, 48

Diagnosis. Although the facies of *M. pastranai* are similar to those of many congeners, the male genitalia deviate considerably. The paired lobes of the uncus are much narrower than in other species, arranged parallel to each other, and separated by a deep, mesal, U-shaped notch; the socii are large and conspicuous; the basal process of the valva is a short angulate process, broadened mesally, with an apical hook; and there is a digitate lobe at the venter of the valva ca. 0.65 the distance from the base bearing a patch of long, straight, spiniform setae. All of these features are interpreted as autapomorphies for the species.

Description. *Head*: Vertex, frons, and labial palpi pale brown. *Thorax*: Dorsum brown mixed with pale brown, metascutum with brown tuft. Hind tibia in male without modified sex scaling. Forewing length 7.0 mm; basal 0.5 pale brown, variegated with brown and creamy brown, with a few whitish scales; dark brown median fascia from costa 0.45–0.65 distance from base, well defined along basal edge, less defined along

edge, with an indentation of pale ground color near end of discal cell; an elongate-ovate, brown and red-brown patch in terminal area below apex. Fringe brown. Hindwing brown, anal margin in male lacking distinct patch of sex scales. *Abdomen*: Brown. Male genitalia (Fig. 48; 3 preparations examined) with tegumen elongate, narrow; uncus lobes parallel, ca. 2.5 times as long as wide, separated by a deep, narrowly U-shaped notch; socius well defined, short, ovate, densely hairy; remnant of gnathos weakly sclerotized, with large, oar-shaped mesal process; valva narrow, broadest at base and at 0.67 distance from base, the latter region with a lobelike ventral projection bearing long, straight, hairlike setae; short triangular process near venter ca. 0.25 distance from base, bearing a small patch of short straight setae; basal process of valva short, somewhat triangularly broadened mesally, with short, curved apical hook. Phallus short, ca. 0.5 length of valva, curved ca. 0.33 distance from base; slightly narrowed distally, vesica with a single spinelike cornutus and diffuse patch of spinules. Female genitalia unknown.

Holotype. Male, Argentina, Misiones, Puerto Rico, 4–8 April 1971, C. M. & O. S. Flint (USNM), USNM slide 124,489.

Paratypes (2♂). ARGENTINA: **Misiones**: Puerto Rico, 4–8 April 1971 (1♂), C. M. & O. S. Flint (USNM). BRAZIL: Nova Teutonia, May 1953 (1♂), F. Plaumann (USNM).

Distribution and Biology. *Megalota pastranai* is recorded from Argentina and Brazil. Nothing is known of the early stages.

Etymology. This species is named for the late José Pastrana, a noted Argentine lepidopterist.

Biology

As with most Neotropical microlepidoptera, little is known about the biology of *Megalota*. Horak (2006) reported *Croton* (Euphorbiacae) and *Acacia* (Fabaceae) as hosts from Australia. Based on rearing records from Costa Rica (Janzen & Hallwachs 2007), *Megalota* appears to specialize on *Croton* species (Euphorbiaceae) in the New World. According to Marianne Horak (personal communication), most monophyletic groups of Olethreutinae exhibit moderate host plant specialization at the generic level, hence the pattern that emerges from the limited rearing records may be meaningful. In Costa Rica documented hosts of *Megalota* include *Croton billbergianus* for *M. ochreoapex* (n = 3 individuals) and *M. crassana* (n = 5); *Croton schiedeanus* for *M. simpliciana* (n = 5), *M. ricana* (n = 4), and *M. bicolorana* (n = 1); *Croton gossypifolius* for *M. aquilonaris* (n = 1); and *Croton niveus* for *M. ricana* (n = 1). With its pantropical distribution, Euphorbiaceae may function as larval hosts for *Megalota* throughout the considerable worldwide range of the plant family. Two other genera in the same subtribe as *Megalota*, i.e., *Eccopsis* Zeller and *Temnolopha* Lower, also have been reared from Euphorbiaceae (Horak 2006), suggesting an adaptation to this plant family by a group much broader than just *Megalota*.

Based on notes from the 23 reared individuals (Janzen & Hallwachs 2007), the larvae of *Megalota* are green with a yellow or brown head. Development requires 7–17 days from pre-pupa larva to eclosion. No parasitoids have been reported.

Distribution and biogeography

In the New World, species of *Megalota* have been recorded from southern Texas, United States, through the Caribbean (Dominica, Jamaica, Grenada, St. Lucia), Mexico, and Central America (Costa Rica, Guatemala, Mexico, Panama) to South America (Argentina, Brazil, Ecuador, Peru, Venezuela), including the Galapagos Islands (Razowski *et al*. 2008). Greatest species richness is documented from Costa Rica with 11 species, but this pattern is undoubtedly biased by the intensity of collecting activities. Several species of *Megalota* (e.g.,

M. submicans, *M. vulgaris*, *M. simpliciana*) are restricted to elevations below about 500 m. In contrast, several others (e.g., *M. bicolorana*, *M. deceptana*, *M. longisetana*) are rare in the lowlands, with most specimens collected between about 500–1200 m. Specimens collected on the ALAS project, a 5-year inventory the goal of which was to document changes in species richness along an elevational gradient (0–2000 m) in Costa Rica, suggest differing species' abundances at different elevations. *Megalota vulgaris* appears to be restricted to the lowland, collected only between 50–150 m (n = 84); *M. spinulosa* likewise is a lowland species, collected at 50–150 m (n = 68), except for a single individual taken at 250–350 m; *M. simpliciana* is primarily a lowland species, collected from 50–150 m (n = 25), with a single specimen from 450–550 m; and *M. delphinosema* was collected at 50–150 m (n = 9) and 450–550 m (n = 3). The last species ranges from near sea level (in Costa Rica) to 1100 m at Rancho Grande, Venezuela. Most species are represented by too few individuals to draw any meaningful conclusions.

While the discovery of *Megalota* in the New World tropics may appear to complete a southern continental distribution (i.e., Australia, Madagascar, Africa, and South America), the group does not have a true Gondwanan origin. Its absence from New Zealand, its restriction to the Australotropical Region of Australia (*sensu* Morrone 2002), its fairly widespread occurrence in the Oriental Region, and its broad distribution in the New World (from the southern U.S. to Argentina) all suggest a different explanation. All of the genera putatively closely related to *Megalota* (e.g., *Eccopsis*, *Cosmorrhyncha*, *Temnolopha*, and *Costosa* Diakonoff) are centered in the Oriental and/or Afrotropical regions, although *Cosmorrhyncha* exhibits an African-South American distribution.

Disjunct tropical distributions, especially those restricted to the southern continents, frequently are attributed to Gondwanan vicariance. However, many of these groups are merely pantropical as described by Renner *et al*. (2001), Davis *et al*. (2002), Moyle (2005), and others for taxonomically disparate groups (e.g., plants and birds). In these groups dispersal and subsequent extinction have played vital roles in determining the pattern observed today. The current distribution of *Megalota* suggests a pan-tropical distribution consistent with these historical events.

In the absence of a cladistic analysis of *Megalota*, hypothesized relationships among its species are exceedingly provisional. Nonetheless, the taxonomic distribution of a few character states that appear to unite species or species groups is worth considering. The unusual fin- or tongue-shaped signum of members of the *delphinosema* group (e.g., Figs. 55–63) is almost certainly derived within New World *Megalota*. All other species of *Megalota* worldwide (e.g., Aarvik 2004: fig. 63; Horak 2006: fig. 353) and all putative outgroups (e.g., Aarvik 2004: fig. 25) possess a signum of two or more small, erect shark-tooth-shaped sclerites (*sensu* Horak 2006). Hence, the tongue-shaped signum may provide evidence that the most derived lineage of *Megalota* is found in the Neotropics.

In the male genitalia, the conspicuous incurved process from the middle of the valva, densely clothed by long hairs (e.g., Figs. 25–30), is shared by all species of the *submicans* group, but also by *M. purpurana* Aarvik from Kenya (Aarvik 2004: fig. 64). In nearly all New World *Megalota* with the incurved process (i.e., *submicans* group), the shape of the sacculus of the valva is slightly asymmetrical from the left to the right side, and the lower edge of the sacculus bears a patch of extremely elongate setae (e.g., Figs. 25–30), both features of which are absent from *M. purpurana*, other species of *Megalota*, and all outgroups. Hence, these character states likewise may provide evidence for the derived nature of this group of Neotropical *Megalota*. Male genitalia in the *pastranai* and *plenana* species groups are so highly derived that assignment of these species to *Megalota* is not without question, providing further evidence that Neotropical *Megalota* are among the most derived species in the genus. The male genitalia of species from Australia, the Orient, and Africa (excluding *M. purpurana*) are simple and more similar to some New World members of the *delphinosema* group.

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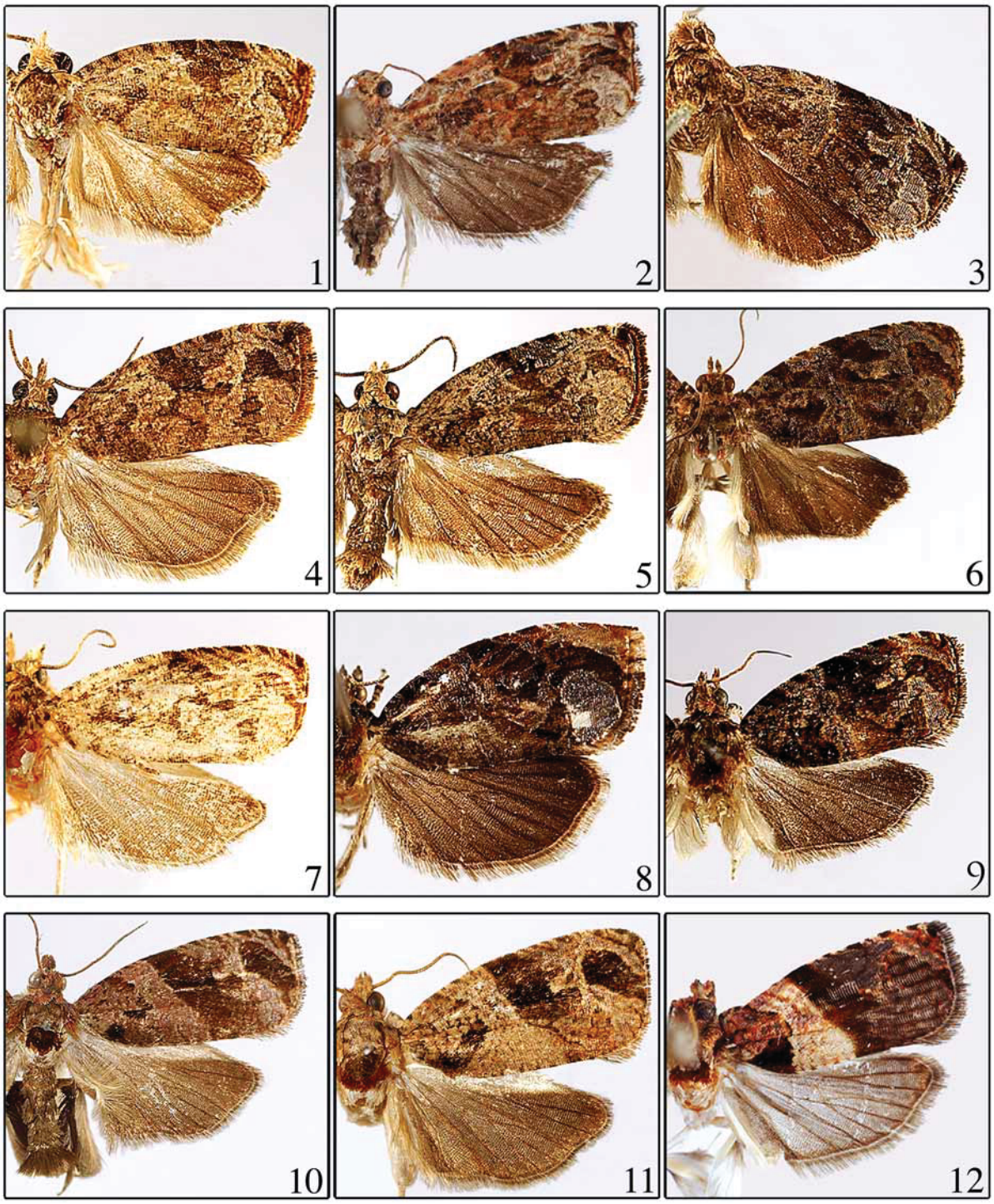
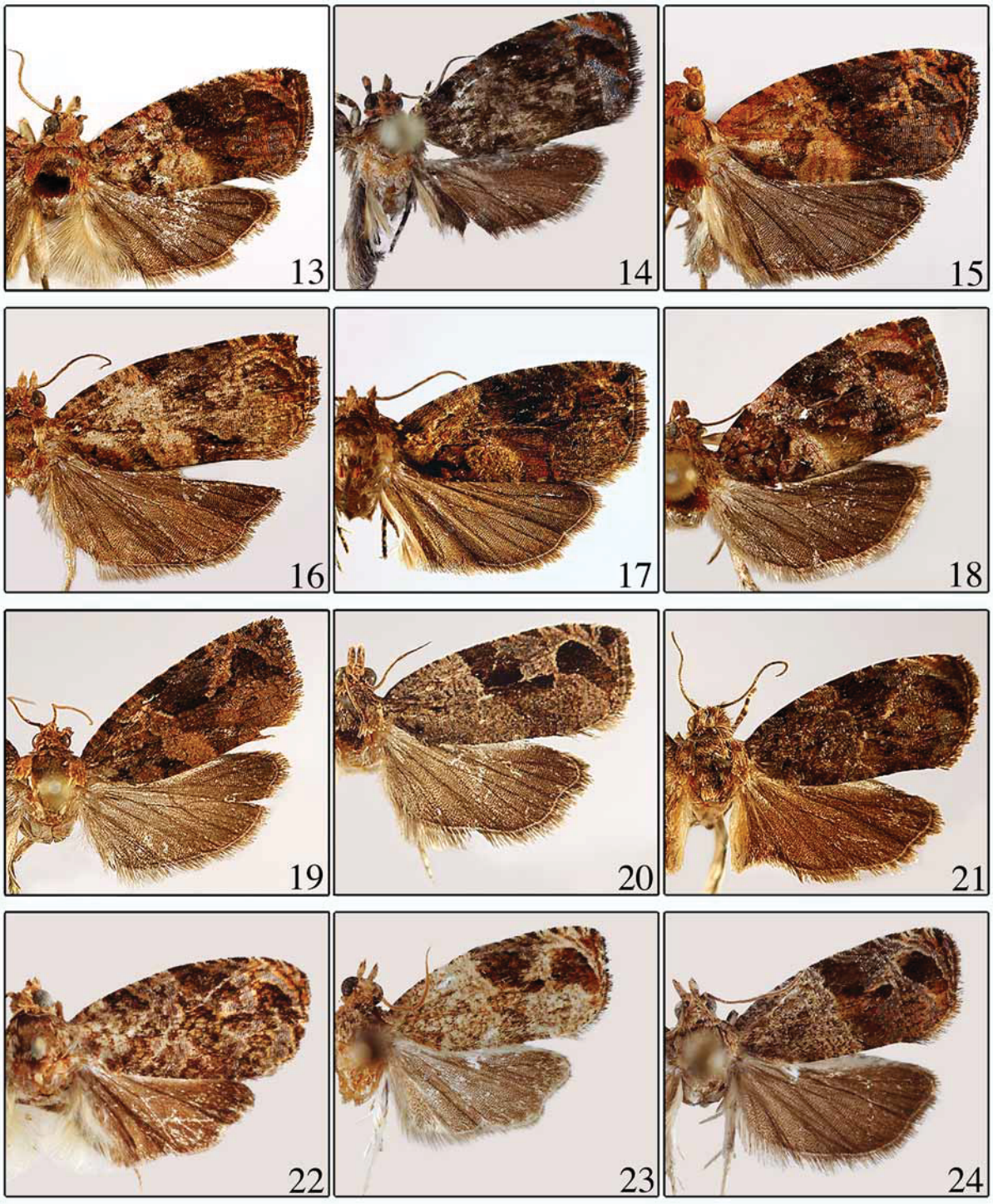
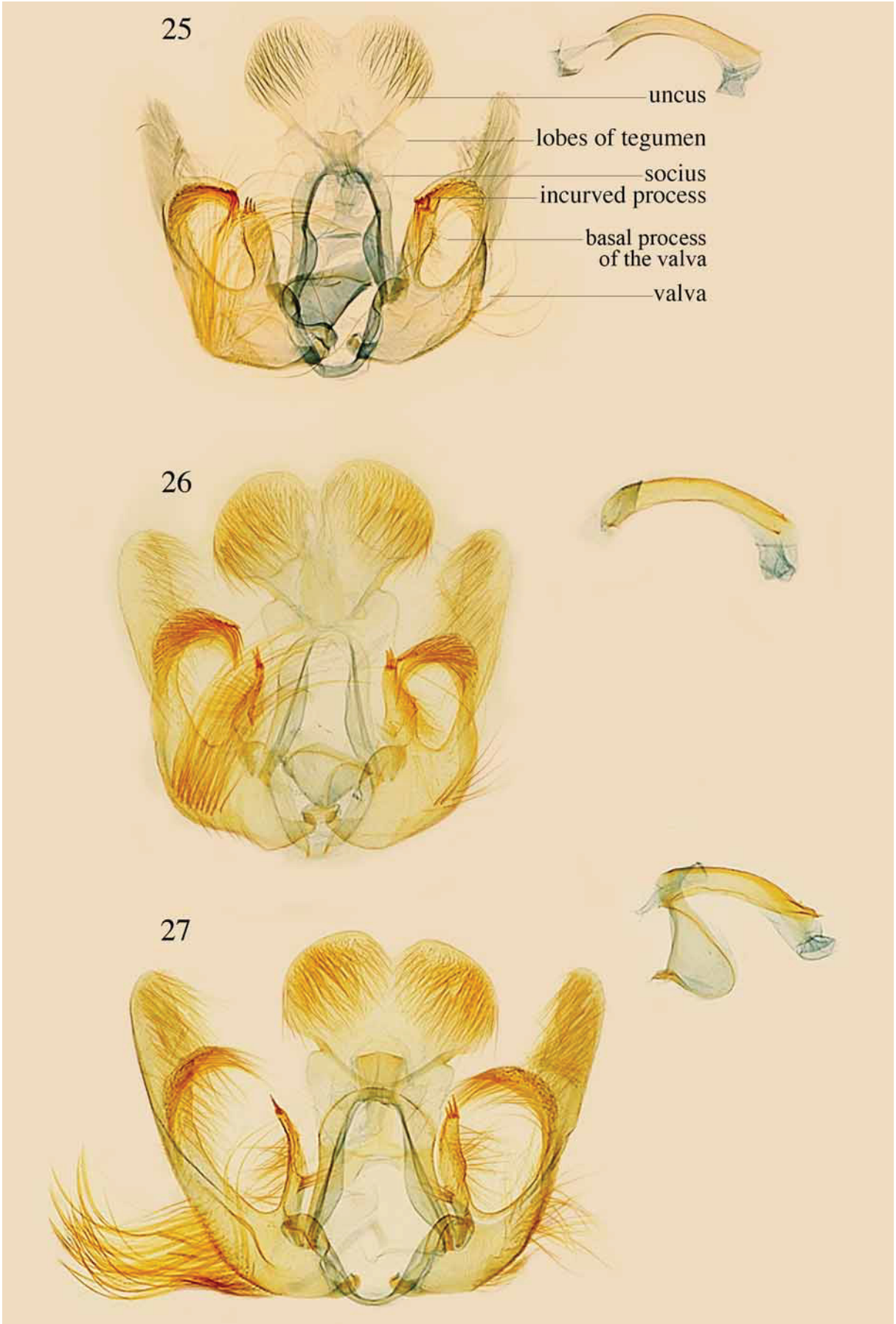


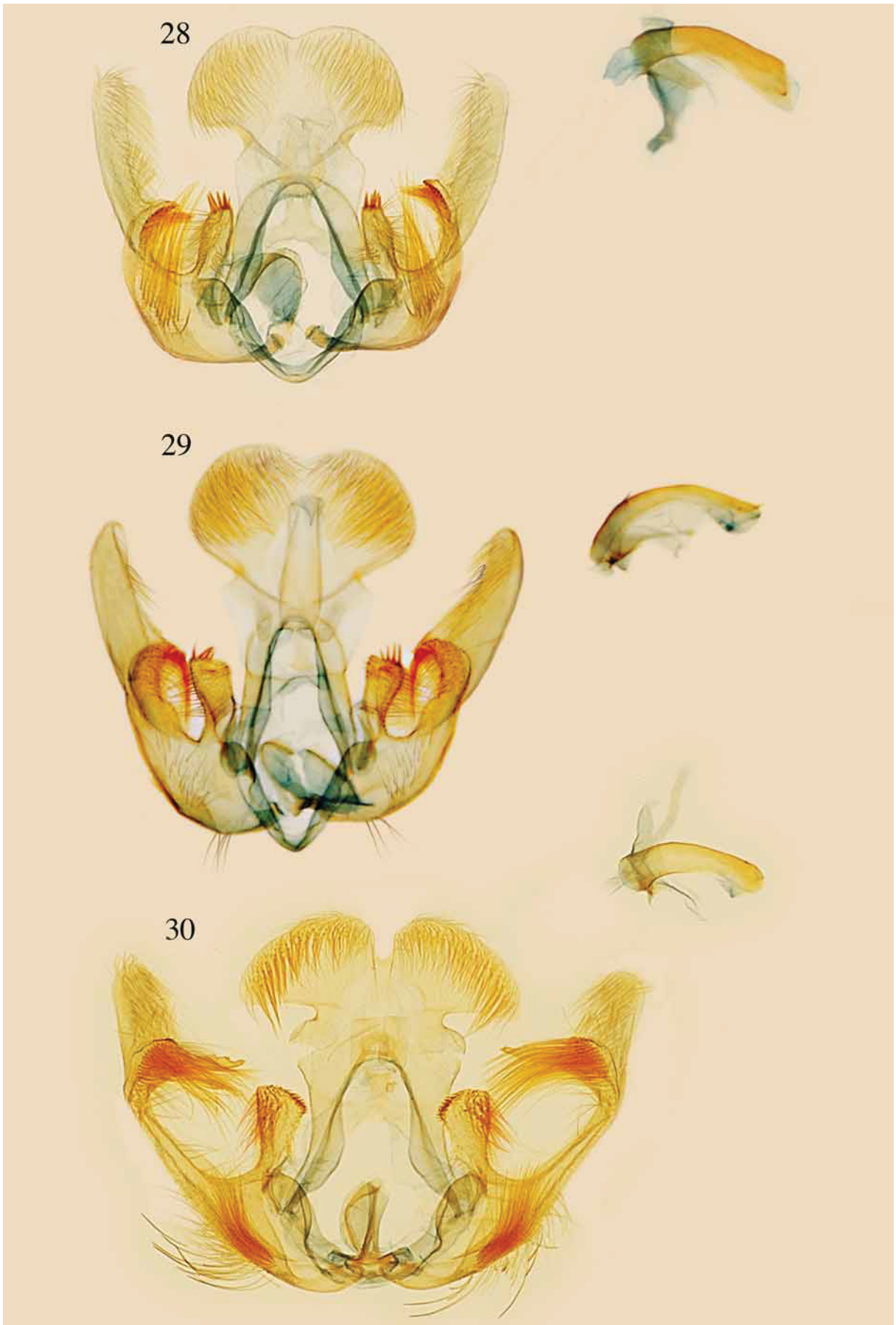
FIGURES 1–12. Adults of *Megalota*. 1. *M. submicans* (holotype), 2. *M. synchysis* (paratype), 3. *M. peruviana* (paratype), 4. *M. aquilonaris* (holotype), 5. *M. vulgaris* (paratype), 6. *M. cacaulana* (holotype), 7. *M. macrosocia* (holotype), 8. *M. ochreoapex* (holotype), 9. *M. spinulosa* (holotype), 10. *M. simpliciana* (paratype), 11. *M. delphinosema* (Costa Rica), 12. *M. jamaicana* (holotype).



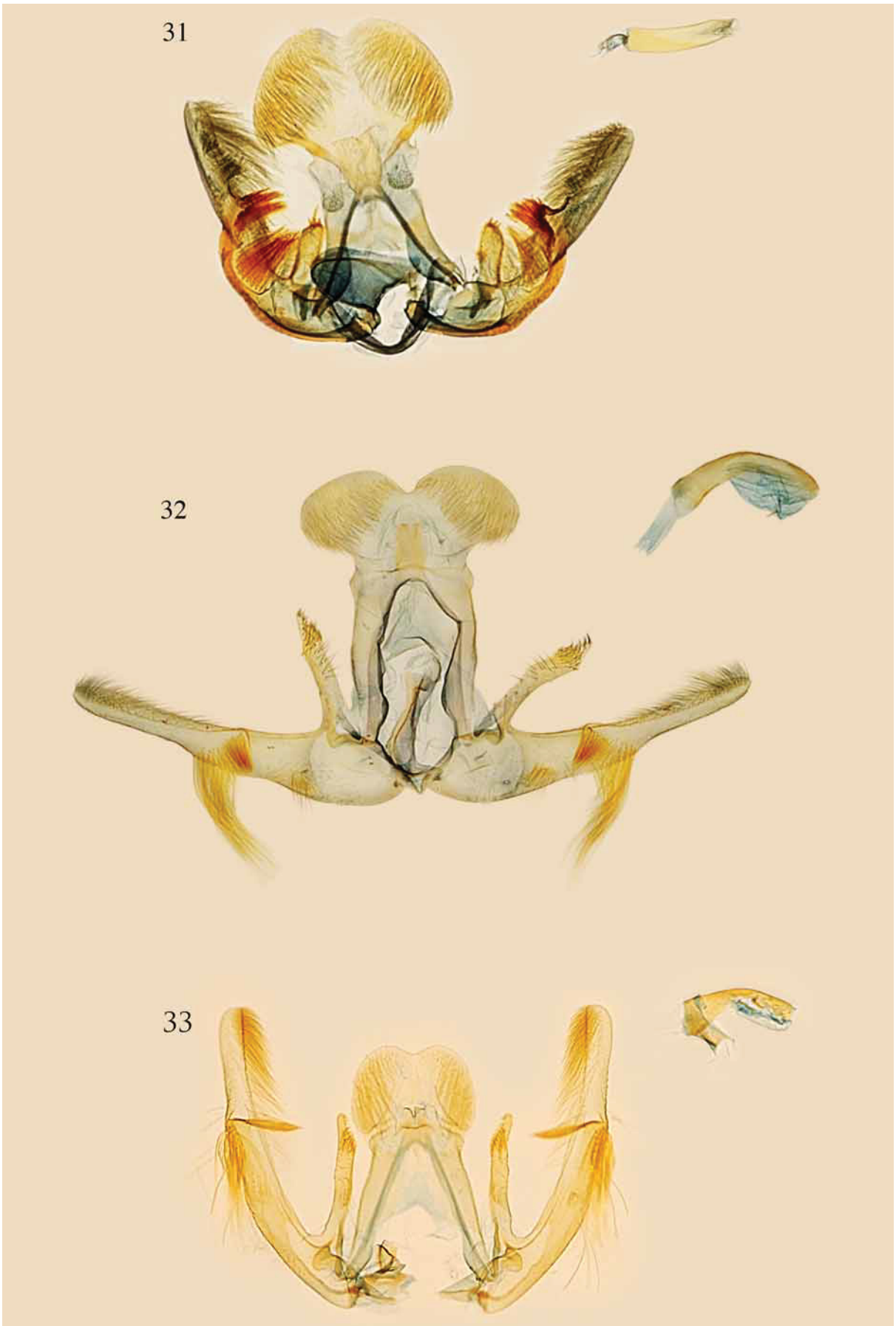
FIGURES 13–24. Adults of *Megalota*. 13. *M. ricana* (holotype), 14. *M. ceratovalva* (holotype), 15. *M. bicolorana* (holotype), 16. *M. longisetana* (holotype), 17. *M. deceptana* (holotype), 18. *M. crassana* (holotype), 19. *M. gutierrezi* (holotype), 20. *M. chamelana* (holotype), 21. *M. beckeri* (holotype), 22. *M. plenana* (holotype), 23. *M. flintana* (holotype), 24. *M. pastranai* (holotype).



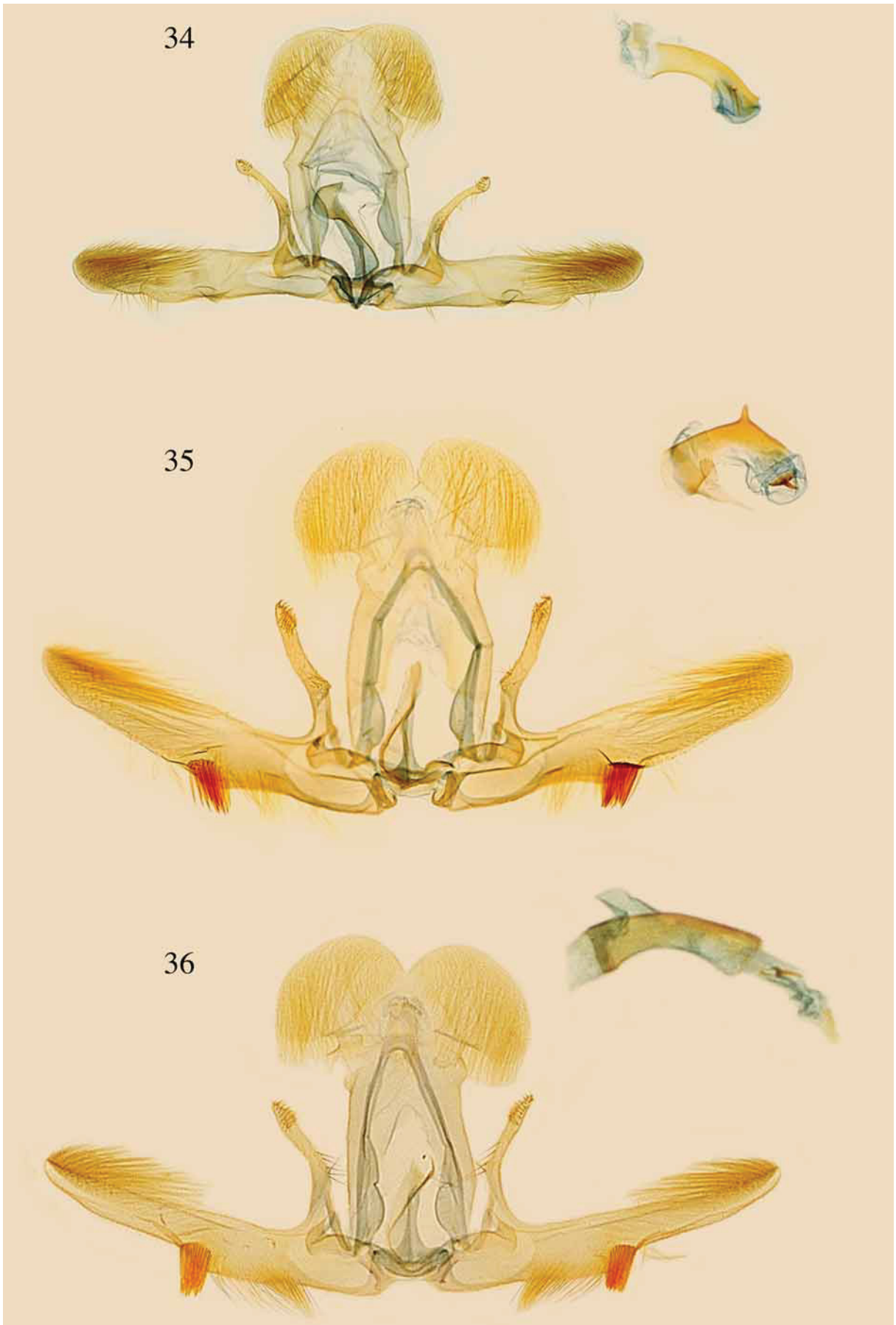
FIGURES 25–27. Male genitalia of *Megalota*; valva spread, phallus removed. 25. *M. submicans*, image of USNM slide 85,857; 26. *M. synchysis*, image of USNM slide 84,873; 27. *M. peruviana*, image of USNM slide 84,891.



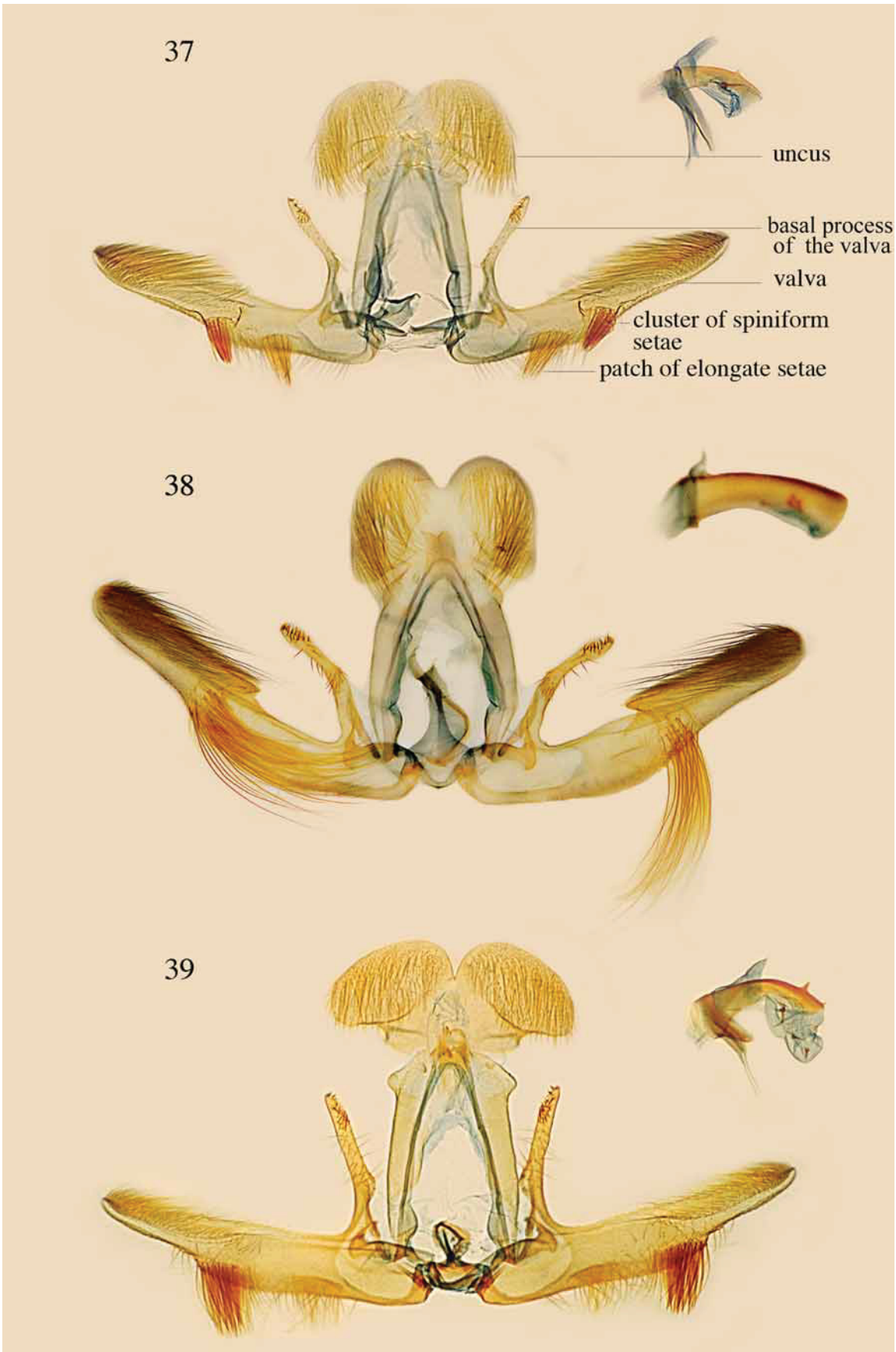
FIGURES 28–30. Male genitalia of *Megalota*; valva spread, phallus removed. 28. *M. aquilonaris*, image of USNM slide 124,098; 29. *M. vulgaris*, image of USNM slide 124,184; 30. *M. cacaulana*, image of USNM slide 85,871.



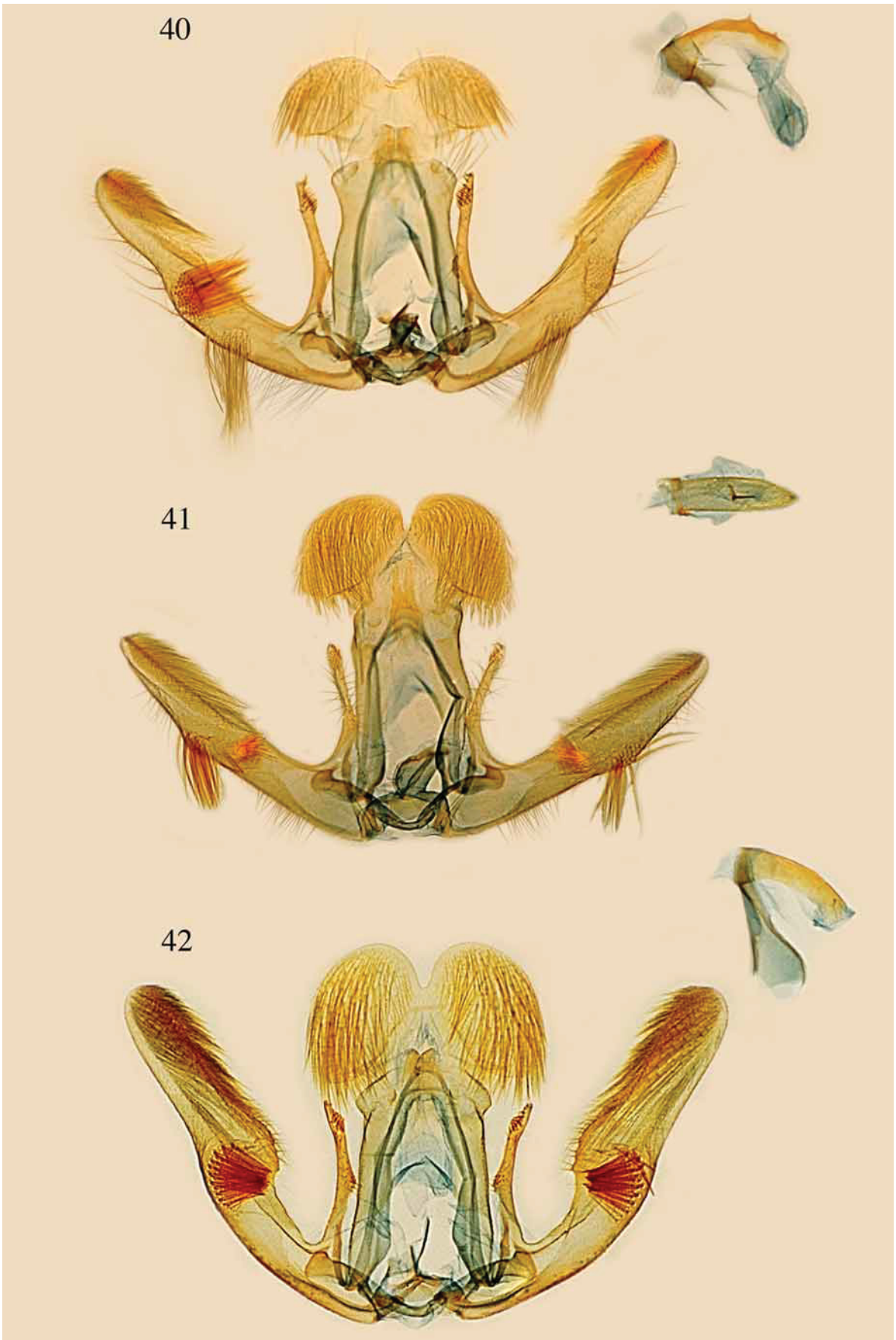
FIGURES 31–33. Male genitalia of *Megalota*; valva spread, phallus removed. 31. *M. macrosocia*, image of USNM slide 124,139; 32. *M. ochreoapex*, image of USNM slide 85,863; 33. *M. spinulosa*, image of USNM slide 84,895.



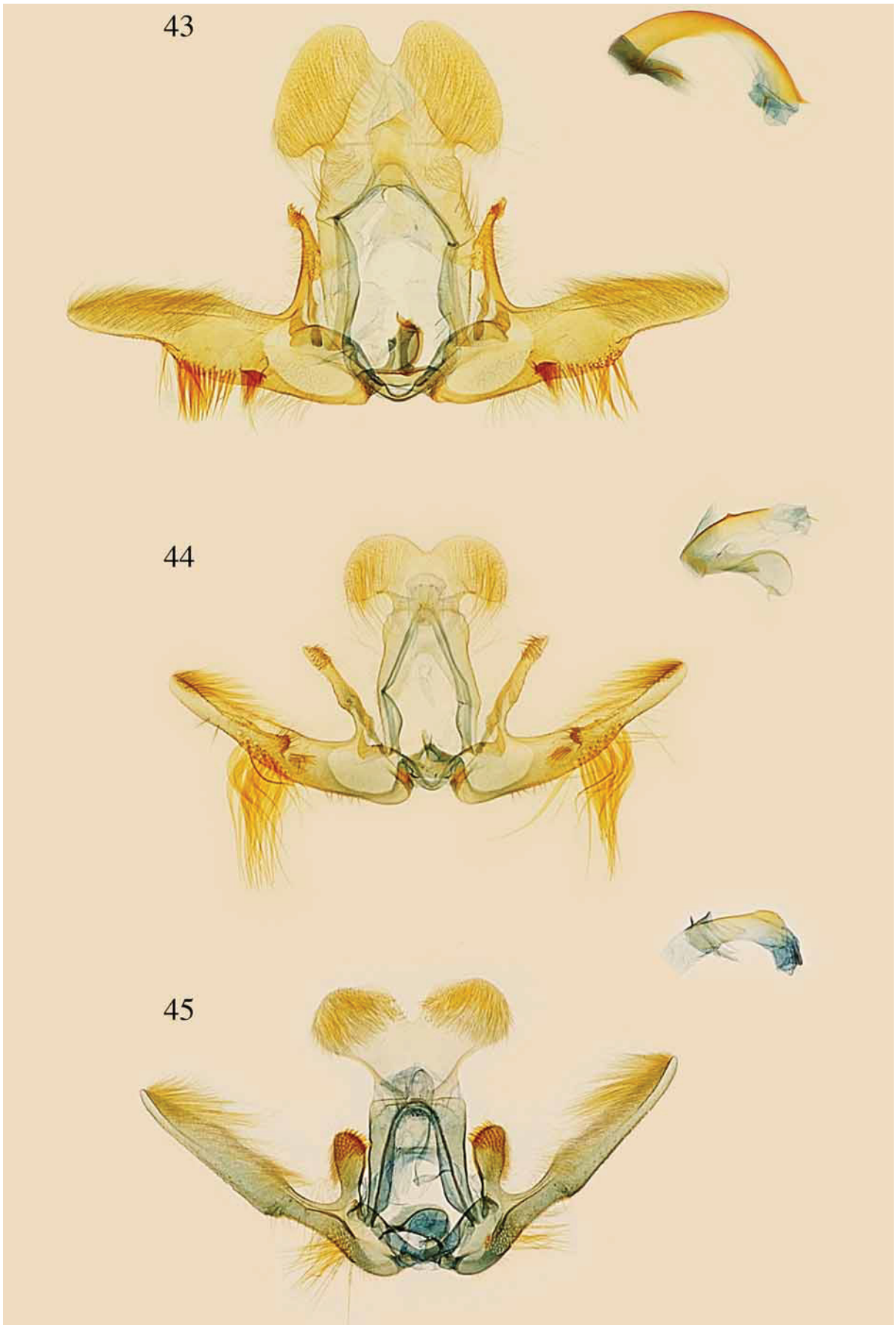
FIGURES 34–36. Male genitalia of *Megalota*; valva spread, phallus removed. 34. *M. simpliciana*, image of USNM slide 85,851; 35. *M. delphinosema*, image of USNM slide 84,895; 36. *M. jamaicana*, image of USNM slide 124,108.



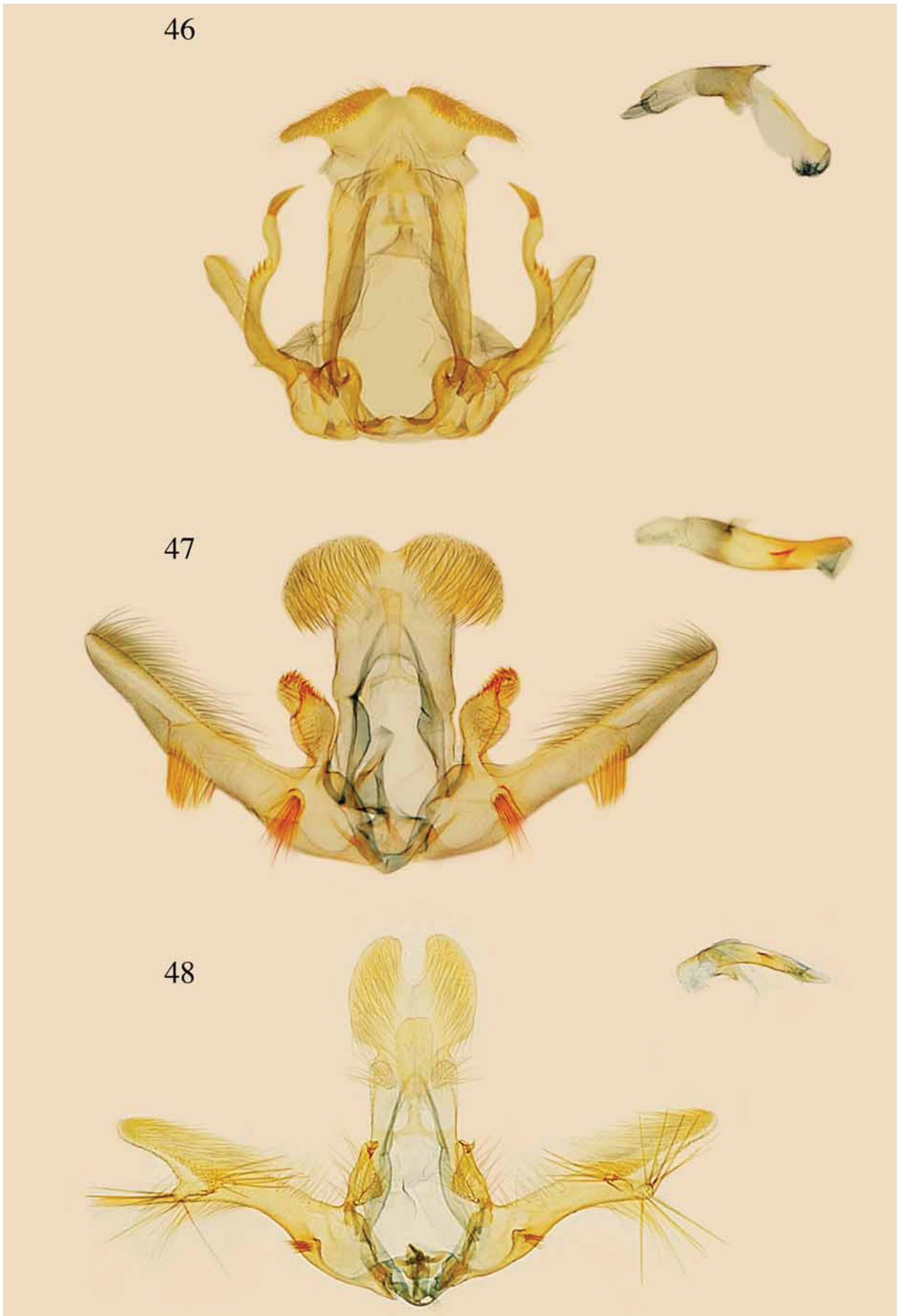
FIGURES 37–39. Male genitalia of *Megalota*; valva spread, phallus removed. 37. *M. ricana*, image of USNM slide 85,875; 38. *M. ceratovalva*, image of USNM slide 124,496; 39. *M. bicolorana*, image of USNM slide 84,863.



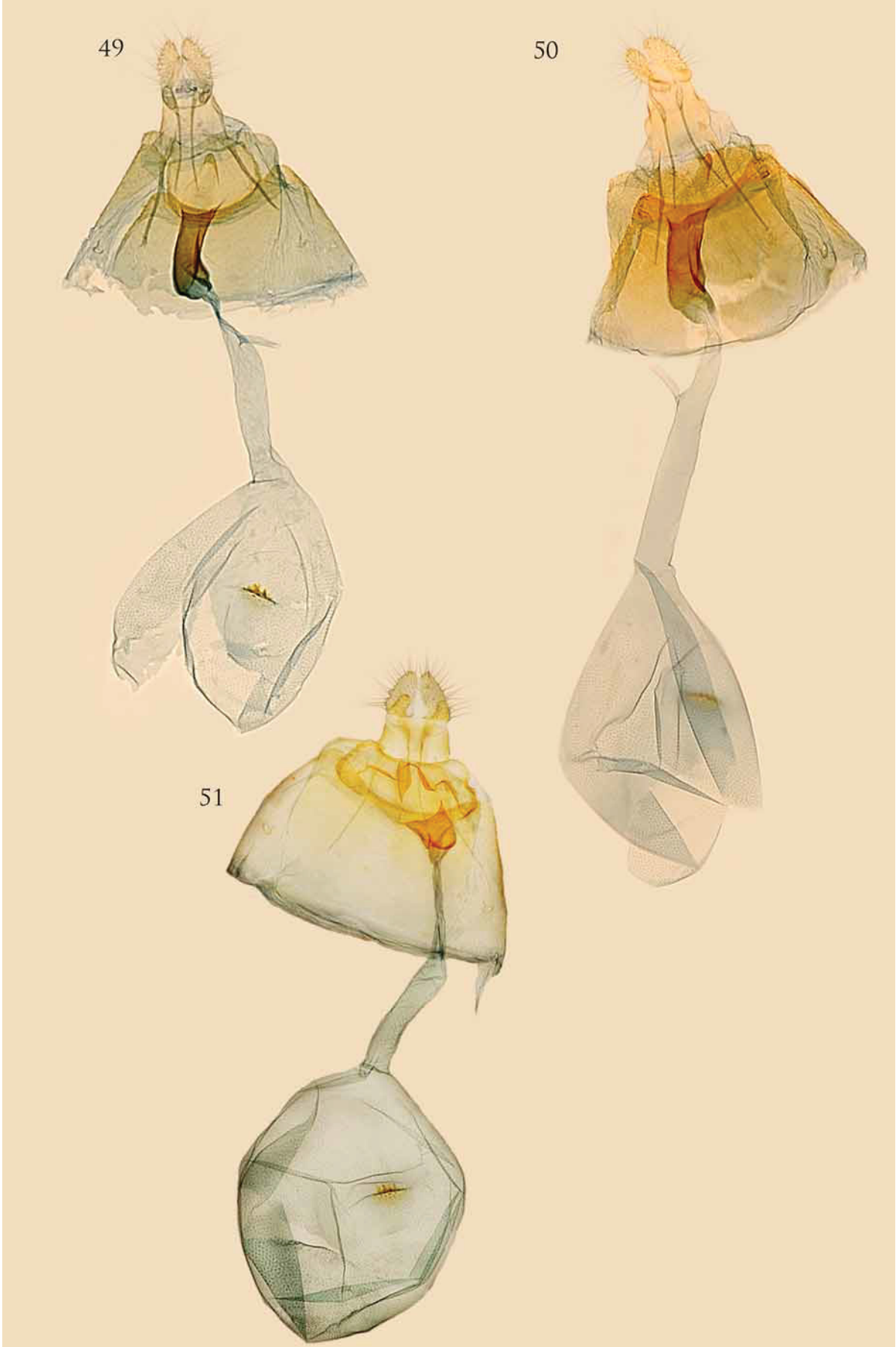
FIGURES 40–42. Male genitalia of *Megalota*; valva spread, phallus removed. 40. *M. longisetana*, image of USNM slide 124,094; 41. *M. deceptana*, image of USNM slide 94,887, ventral rather than lateral view of phallus; 42. *M. crassana*, image of USNM slide 95,342.



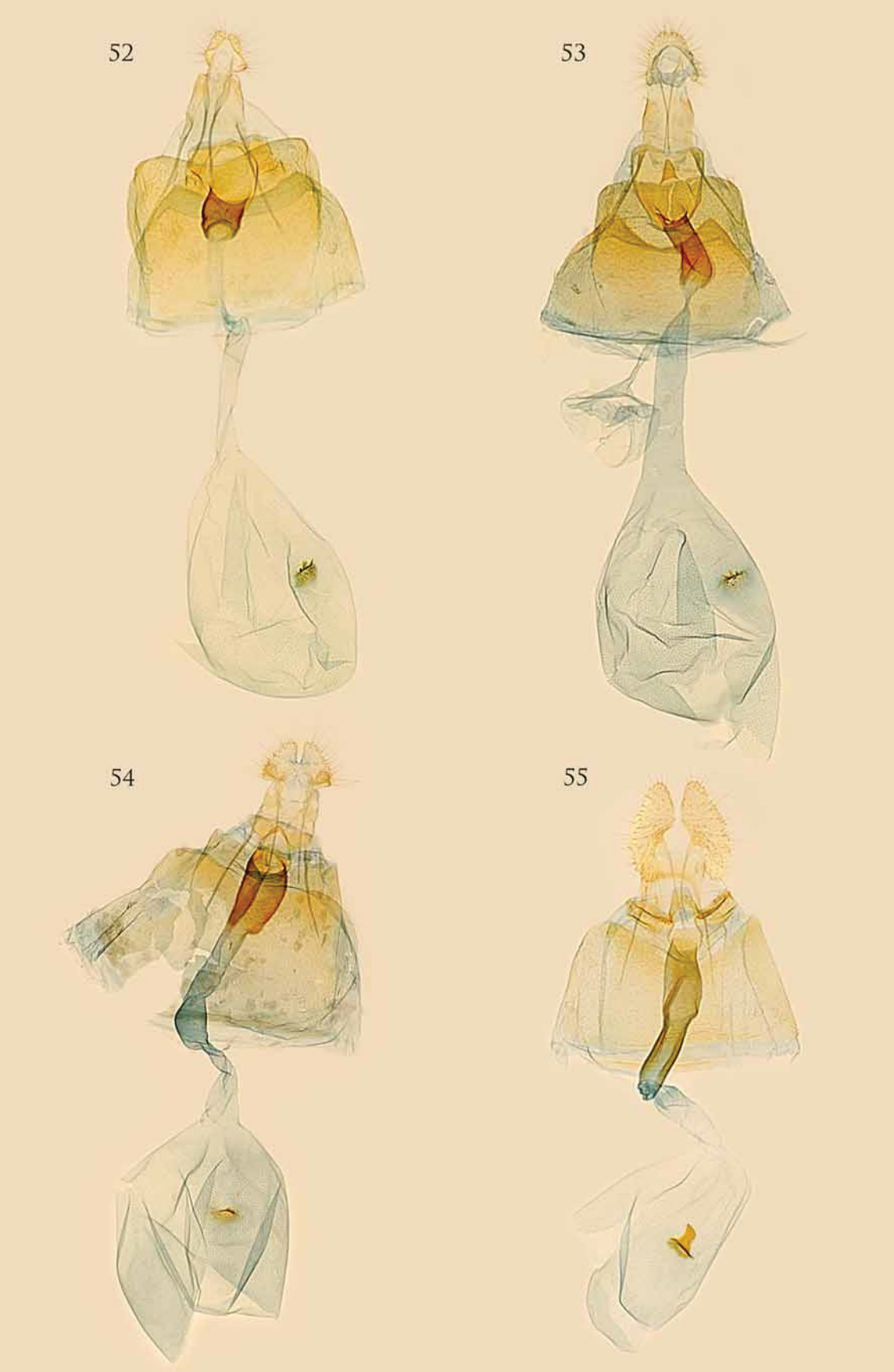
FIGURES 43–45. Male genitalia of *Megalota*; valva spread, phallus removed. 43. *M. gutierrezi*, image of USNM slide 84,883; 44. *M. chamelana*, image of USNM slide 84,897; 45. *M. beckeri*, image of USNM slide 124,145.



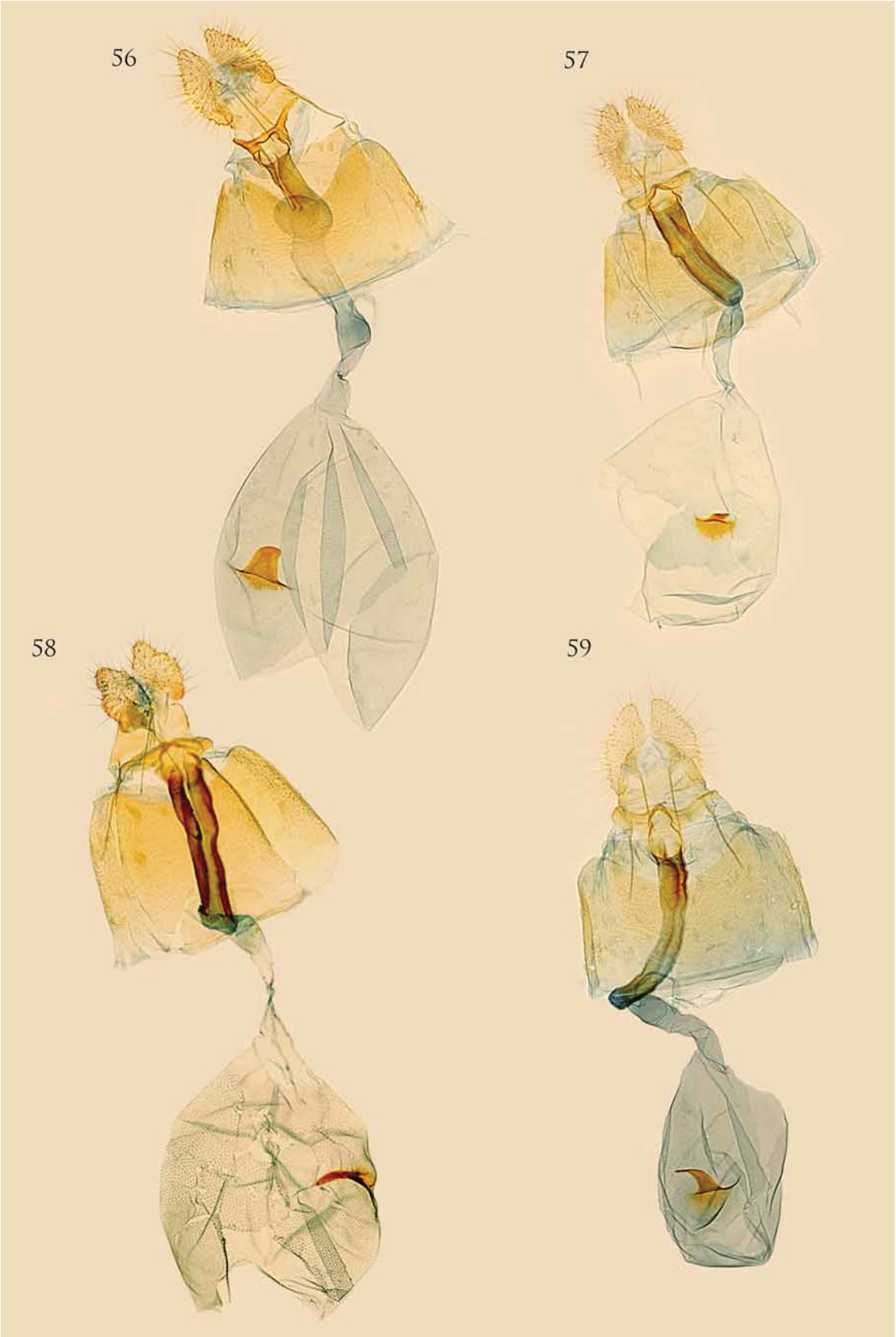
FIGURES 46–48. Male genitalia of *Megalota*; valva spread, phallus removed. 46. *M. plenana*, image of BMNH slide 31,397; 47. *M. flintana*, image of USNM slide 124,500; 48. *M. pastranai*, image of USNM slide 84,885.



FIGURES 49–51. Female genitalia of *Megalota*. 49. *M. submicans*, image of USNM slide 85,858; 50. *M. synchysis*, image of USNM slide 124,115; 51. *M. peruviana*, image of BMNH slide 31,399.



FIGURES 52–55. Female genitalia of *Megalota*. 52. *M. aquilonaris*, image of USNM slide 124,109; 53. *M. vulgaris*, image of USNM slide 95,323; 54. *M. ochreoapex*, image of USNM slide 85,864; 55. *M. spinulosa*, image of USNM slide 84,874.



FIGURES 56–59. Female genitalia of *Megalota*. 56. *M. simpliciana*, image of USNM slide 95,367; 57. *M. delphinosema*, image of USNM slide 84,864; 58. *M. ricana*, image of INBio slide 38,789; 59. *M. bicolorana*, image of USNM slide 85,869.

FIGURES 60–63. Female genitalia of *Megalota*. 60. *M. longisetana*, image of USNM slide 84,894; 61. *M. deceptana*, image of USNM slide 84,886; 62. *M. crassana*, image of USNM slide 95,343; 63. *M. gutierrezi*, image of USNM slide 84,876.